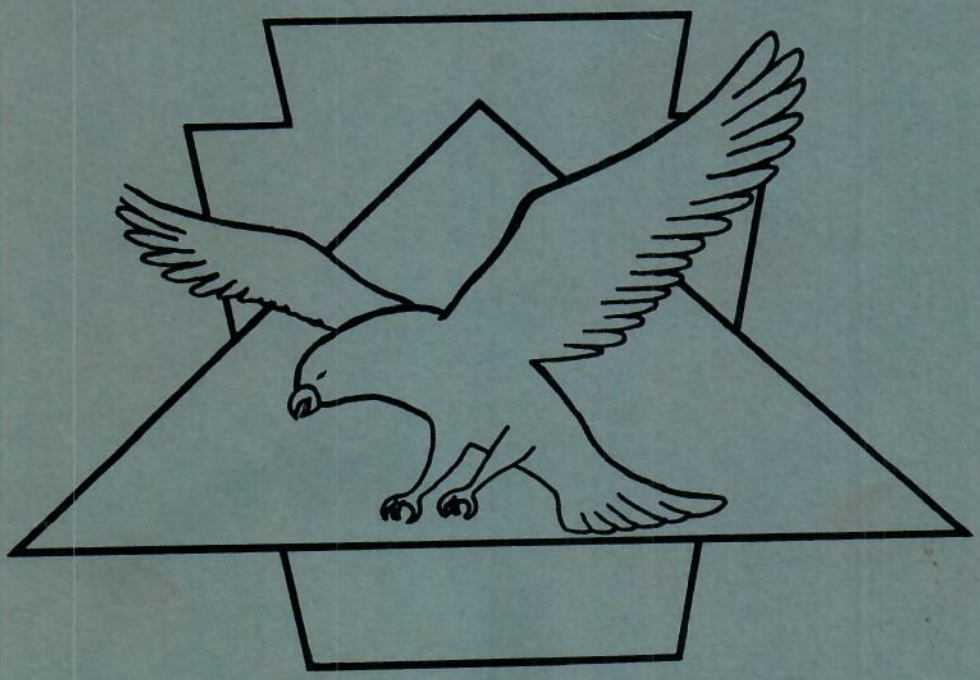
LAND SEARCH AND RESCUE

A MANUAL FOR THE TRAINING OF
CIVIL AIR PATROL RANGER TEAMS



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PENNSYLVANIA WING, CIVIL AIR PATROL

LAND SEARCH AND RESCUE

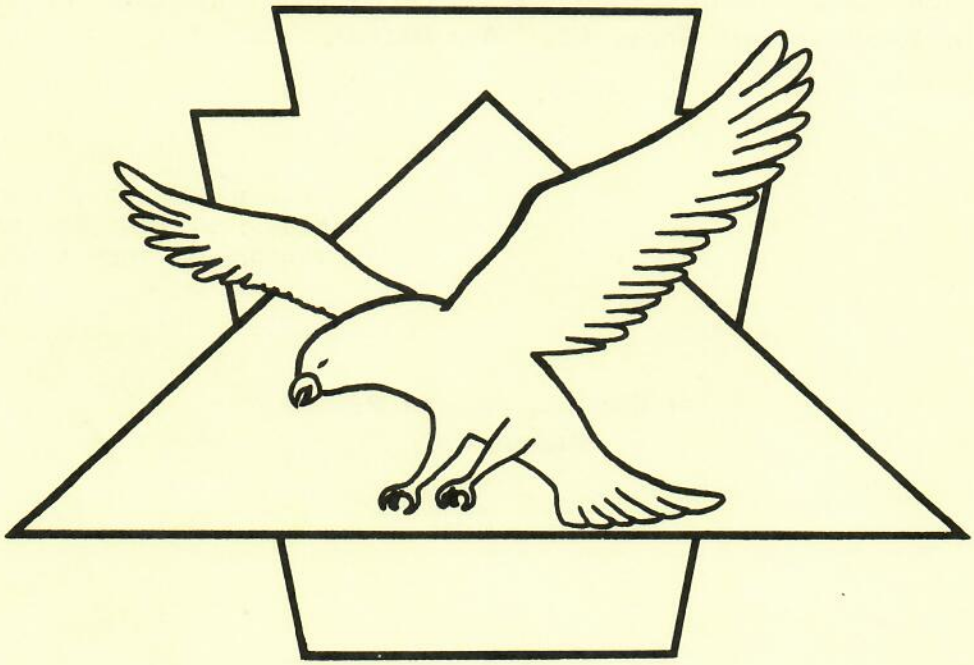
A MANUAL FOR THE TRAINING OF CIVIL AIR PATROL RANGER TEAMS

PART ONE

LEVELS OF ADVANCEMENT

and

INDIVIDUAL SKILLS



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DEDICATION

There are many individuals who have made important contributions to the Ranger Program over the years. This manual could easily have been dedicated either to Colonel Phillip Neuweiler or to Lt. Colonel John Weaver for their pioneering work in the Ranger Program. However, at this point we would like to honor one other individual--a person who has been active in the Program for many years, and for the last three years has served as the Pennsylvania Wing Ranger Commander. It is a tribute to his genius for organization and administration that the Program has experienced unprecedented expansion and has received recognition across the entire Nation. Without the continued support and encouragement of this individual, this Training Manual could not have come into existence.

It is with great pleasure that we dedicate this first issue of Land Search and Rescue to Lt. Colonel John H. McNabb, CAP.

PREFACE

In December of 1962, a simulated casualty started on what was to become a historic trip - a fifty mile cross country stretcher ride from Scranton to Allentown. Organized by the late Lt. Col. John Weaver, the stretcher carry was accomplished by relays of 12 man Ranger Teams of the Civil Air Patrol. Each Team was assigned a portion of the route and given a point where they would meet the preceding Team. The idea was an ambitious test of the capabilities of these Teams, but what made the event of even greater importance was that the weather refused to cooperate. A major snow storm was in progress at the time the carry was scheduled to start. With a spirit and determination which was amazing to outsiders, but which was a normal part of their training, the Ranger Teams carried the litter on the original schedule through snow storm and freezing weather right through to their destination.

Let us take a closer look at these Ranger Teams.

Since its inception, Civil Air Patrol has been providing air search capabilities for domestic and military emergencies. During the war years following 1941, CAP's resources were channeled largely into coastal air patrols, seeking enemy submarines and the survivors of submarine depredations. Although some ground search units sprang up here and there, no formal structure was established to guide their training and employment.

After the war years, aerial searching was organized nationwide into a highly effective form. Procedures for the coordination of aerial search efforts were established, including standard methods of establishing operations bases, and the country's largest non-military radio network. But without the development of an organized ground search Team to complement the aerial search and communications "arms", a link in the chain of effective search and rescue remained missing.

In the early 1950's, positive action to establish such a link took place under the direction of Col. Phillip Neuweiler of the Pennsylvania Wing. The concept of the Ranger Team was born, and an effective means of organizing these search units for training and actual missions on a statewide level was developed. Under the active leadership of the late Reverend John Weaver, the Ranger program evolved into a dual purpose program - not only did it provide an organization for search and rescue operations, but the training offered to the cadets became a worthwhile feature in itself. In this program, cadets not only learned confidence in their own skills and ability to cope with difficult problems, but were provided with an opportunity to dedicate themselves to an unselfish service to others.

For more than a decade, the Ranger training remained almost unique to the Pennsylvania Wing. Instruction was mostly by "word of mouth" at the start, but as the program grew, Training became more formalized. Two annual training schools were established at Pennsylvania's Hawk Mountain Ranger Training Area - a nine day Summer Ranger Training School and a weekend Winter Survival School. Also, in 1959, a comprehensive Ranger Team SOP was published by Lt. Col. Weaver to put in writing some of the techniques developed at Hawk Mountain and provide some training continuity for those unable to attend the schools.

In presenting this Ranger Training Manual to the reader, we would like to acknowledge that much of the work comes from outside sources. Training Manuals of the appropriate military services have been liberally abstracted, paraphrased, and directly quoted. However, we would be remiss not to mention the personal contribution of Col.Neuweiler who contributed much first hand material to the survival section, - to the material from the 1959 SOP, which has been updated and included, - and, finally, to the procedures and techniques developed over the years by the many imaginative Ranger Team Commanders. In a sense, this Training Manual represents the Ranger Program completing a full circle, since two out of the three authors were active participants in the Program as cadets during its formative years.

The reader will find that he is frequently directed to reference material. This was necessitated due in part to copyright problems, in part to the time involved in re-stating material which had already been given excellent coverage in a reference, and lastly, to save the expense of re-printing material readily available. We advocate that local units start a Ranger library which will contain a few copies of each book that is referred to most frequently in this manual.

Our thanks are extended to Capt. Paul Stipp for his valuable contributions to Section 1, and to three State College residents who assisted materially with this manual. Richard T. Wernham and G. Andrew Wernham made many helpful contributions to the Woodsmanship section of this manual, and Scott Kostenbauder provided a professional touch in preparing the photographs appearing herein.

A special vote of thanks is also due to a Non-CAP member, Cyril D. Jensen, who has contributed many and varied skills, and much tireless patience in editing and organizing this manual and coordinating the sporadic efforts of the authors. His many years of experience as a North Woods Surveyor, Boy Scout Leader, College Professor, and Scientific Administrator have proved invaluable.

Norman Geisinger
Thomas Jensen
Glen Kreider

TABLE OF CONTENTS

SECTION	PAGE
Introduction	1
1.0 Levels of Advancement.	3
1.1 Ranger Third Class (R/3)	3
1.2 Ranger Second Class (R/2).	4
1.3 Ranger (R/1)	4
1.4 Advanced Ranger (R/Ad)	5
1.5 Expert Ranger (R/Ex)	6
2.0 Individual Skills.	7
2.1 Woodsmanship	10
.1 Mission Preparedness	10
.2 Equipment Needs of the Inidividual Ranger.	13
.3 General Camping Skills (Campsite Selection, Shelter Construction, Bedding, Garbage Disposal & Field Sanitation, Fire Building, Knots, Food Preparation, Respect for Property)	17
.4 Health and Safety (Cutting Tools, Fire, Health and Sanitation)	49
.5 When Lost: An Introduction to Survival.	61
2.2 Navigation	62
.1 Basic Map Reading.	62
.2 Use of the Magnetic Compass.	69
.3 The Principles of Ranger Navigation.	75
.4 Measurement of Distances in the Field.	82
.5 The Ranger Team in Action: Special Considerations. (Local Variation, Verification of Position, Night Navigation, The Navigation Squad, Sources of Error)	84
2.3 Medical	96
.1 Frostbite.	96
.2 Hyperventilation	99
.3 Excessive Heat	100
.4 Bites	103
.5 Immunization	105
.6 Personal First Aid	105
.7 First Aid Courses: An Overview.	106
2.4 Survival Techniques	107
.1 Psychology and Immediate Action.	107
.2 The Big Decision: To Stay or to Travel.	110
.3 Food Procurement	113
.4 Food Preparation	119
.5 Water.	121
.6 General: Clothing, Shelter, Self-Help	125
2.5 Communications	127
.1 Voice Commands	127
.2 Hand Signals	128
.3 Whistle Signals.	129
.4 Written Messages	129
.5 Radio (Walkie-Talkies)	129
.6 Lines of Communication	132

TABLE OF CONTENTS (Continued)

2.6 Physical Fitness 133
.1 Importance 133
.2 Physical Fitness Tests 133

2.7 Mobility 134
.1 Steep Terrain Obstacles. 134
(Route Finding, Mountain Walking, Use of Ropes, Safety in Mountaineering)
.2 Water Obstacles. 147
.3 Vegetation Obstacles 148
.4 Snow Obstacles 149

2.8 Firearms Familiarization 152
.1 National Rifle Association Program 152
.2 Safety 152
.3 Signalling 153

2.9 Leadership 154
,1 The Leader 154
.2 Drill and Ceremonies 157
.3 Field Team Drill 158
.4 Methods of Teaching. 160
.5 Lesson Plans 167

5.0 References

APPENDICES:

Appendix I. Ranger Insignia and Uniforms
" II. Specific Achievements for Ranger Second Class (R/2)
" III. Physical Fitness Tests
" IV. Ranger Forms
" V. Hand Signals
" VI. Phonetic Alphabet and Radio Prowords
" VII. Individual Equipment Lists
" VIII. Overland Distance Corrections
" IX. Team Navigation Equipment

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Search and Rescue missions in Civil Air Patrol fall naturally into two phases: the Search, involving aircraft and specially-trained observers; and the Rescue, involving groups of men on the ground who work in cooperation with the search aircraft and make the actual trip to the scene of the disaster, render first aid, and evacuate the casualties. When inclement weather precludes flying, these land teams must be able to conduct limited local searches on the ground. In the Pennsylvania Wing, this role of rescuing, and sometimes searching, is performed by an organization known as the Ranger Section.

From the basic definition of the word "ranger " one surmises that a "Ranger Team" must consist of a group of individuals who are highly mobile and self-sufficient. This is an accurate conclusion, and suggests much of the basic training philosophy of a Ranger Team. In addition to high mobility and self-sufficiency, the Ranger Team is mission-oriented, and practiced in the art of navigation over rugged terrain. Thus:

> "Given the location of a casualty by the search pilot, a Ranger Team should be capable of traveling quickly anywhere in the State to the given location, conduct a local ground search to locate the casualty, administer first aid, and solve any local problems necessary for the speedy evacuation of the victim to safety."

Since poor weather often plays a part in causing a disaster, and since many C. A. P. search targets are located in rugged terrain, it becomes doubly evident that a Ranger Team must be completely self-sufficient, and be capable of surmounting any obstacles of weather or terrain.

Experience indicates that the creation of a successful Ranger Team requires an unusual mixture of individual skills, team skills, teamwork, and dedication. This MANUAL can be of material assistance in the matter of guiding the training to improve both individual and team skills, but teamwork and dedication come only through training and inspired leadership. An endeavor has been made in these pages to condense many years of practical experience into a workable manual, and to place it at the fingertips of all who join the Ranger program.

Section 1 outlines a comprehensive training program to record an individual's advancement in mastering Ranger skills. As you look over the program, you will note remarkable similarities to the Boy Scout program. Indeed, we feel that Scout training is a most valuable asset to a Ranger. Section 2 provides reference material for training in individual skills. Section 3 contains material needed in the development of team skills, and it is here that some of the essential differences between the Ranger program and the Boy Scout program become apparent. Simply

stated, it is in this area that the capabilities of a Ranger Team become much more than the sum of the individual skills of its members. Here we witness the interlocking of individually-learned skills that, when put together, provide a team capable of accomplishing the most difficult of search tasks. One has but to watch the intricacies of a litter-carry down a steep slope--an incline so steep that a lone individual in descending it would experience great difficulty. The situation calls for a special belaying procedure, requiring the ultimate in teamwork. The victim must be lashed securely but gently to the litter, and a belay rope attached to the litter. In making the descent, much of the weight of the litter and litter-bearers must necessarily be absorbed by the belay rope. As the descent proceeds, the belay points must be changed smoothly and rapidly, calling for coordinated effort by every member of the team. There is no time for the Commander to instruct each man on his duties. If the operations have been well-learned, the teamwork is a marvel to behold.

One word of caution to anyone considering joining a Ranger Team: Don't become a member unless you are willing to devote yourself totally to the program. A Ranger Team can be called any time to go anywhere and do jobs that no one else can or wants to do. There is a limited amount of physical danger involved, and a search often means spending long hours of drudgery with no reward at all... not even the satisfaction of succeeding in helping someone in distress. The victim may be dead, he may be found by someone else, he may never be found at all, or the whole mission may turn out to be a mistake. The dedicated Ranger does not let this dissuade him, but turns out for the next mission with the same "Let's go!" attitude, knowing that one can never tell in advance how a mission will end, and that the mission at hand might be the one in which his effort will help save a life. This attitude is well summarized in the following Creed, which has been adopted by the Rangers of the Pennsylvania Wing, Civil Air Patrol:

The Ranger Creed

It is my duty as a member of the Rangers of the Civil Air Patrol ground search and rescue service, to save lives, aid the injured, and protect their property.

In order to do this, I will keep myself physically fit at all times.

I will be prepared at all times to perform my assigned duties quickly and efficiently, placing these duties before my personal desires and comfort.

These things I do that others may live.

SECTION 1
LEVELS OF ADVANCEMENT

Five levels of individual achievement, called proficiency grades, are recognized in the Ranger Program. These are, from highest to lowest:

Grade	Abbreviation
Expert Ranger	R/Ex
Advanced Ranger	R/Ad
Ranger	R/1
Ranger, Second Class	R/2
Ranger, Third Class	R/3

Cadets, upon entering the Ranger Program, start at the R/3 grade and work, through training and achievements, towards higher grades. The two lowest grades are cadet grades only and are awarded at the Squadron level. Advancement through the upper three grades, by cadets and seniors alike, is controlled at the Wing level by tests and attendance at Wing Schools. Senior members entering the Ranger Program will remain ungraded until they pass the requirements for R/1 grade.

A patch, indicating his proficiency grade, will be worn on his field uniform by each active Ranger (see Appendix 1). This grade is not a rank and carries no command authority. In addition to a patch, holders of the Expert Ranger grade will wear a black pistol belt with their field uniform. All others are prohibited from wearing this belt.

The details of each proficiency grade follow:

1.1 RANGER THIRD CLASS (R/3)

Qualifications:

1. Must be classified as a Physical Category 1 cadet.
2. Must have completed Phase I of the Cadet Aerospace Education Program.
3. Must be participating and progressing in the Cadet Aerospace Education Program.
4. Must be actively participating in the Squadron Ranger Training Program.
5. Must possess his own copy of this manual.
6. Must have a completed copy of form RNGF-2 on file in his Squadron personnel folder.

If a cadet fails to meet any of the above qualifications at any time, the Senior Ranger Team Commander may remove him from the Ranger Program and will order removal of the R/3 patch from his uniform.

Insignia and Award:

When all of the above qualifications have been met, the cadet will be awarded the R/3 grade and patch. This award will be made on Squadron Special Orders, and a copy placed in the cadet's personnel folder.

1.2 RANGER SECOND CLASS (R/2)

Qualifications:

1. Must be progressing in the Aerospace Education Program.
2. Must have an overall understanding of the Ranger Program, both tactical and training, as set forth in the current Ranger S. O. P.
3. Must be participating in the Ranger Training Program.
4. Must have completed a thorough study of the Woodsmanship and Medical Sections of this manual (Red Cross courses not required at this level).
5. Must thoroughly understand the Ranger Terminology as given in the Glossary of this manual.
6. Must have completed the achievements for R/2 as listed in Appendix 2.

If a cadet fails to meet any of the above qualifications at any time, the Senior Ranger Team Commander may reduce him to an R/3, or may remove him from the Ranger Program, and will order removal of the R/2 patch from his uniform.

Insignia and Award:

The Senior Ranger Team Commander shall determine when the cadet has completed all the above qualifications. When these are completed, the cadet will be awarded the R/2 grade and patch. This award will be made on Squadron Special Orders, and a copy placed in the cadet's personnel folder.

1.3 RANGER (R/1)

Qualifications:

1. If a cadet, he must have completed all requirements for R/2 and be participating and progressing in the Aerospace Education Program.
2. He must be participating in the Ranger Program.
3. Must have a thorough knowledge of this entire manual and the main referenced materials.

4. Must possess a current Red Cross Standard First Aid card or have verifiable equivalent medical training.
5. Must possess the CAP Radio Operator Proficiency Card and FCC Restricted Radiotelephone Operator Permit.
6. Must have participated in a minimum of one Wing SARCAP or REDCAP as a Ranger Team member.
7. Must have passed the Wing Ranger Tests, both written and practical, administered by a member of the Wing Ranger Staff (see Appendix 4, Form RNGF-3).
8. Must have passed the Ranger (R/1) Physical Fitness Test (see Appendix 3) administered by the Wing Ranger Section.

Insignia and Award:

Upon completion of the qualifications listed above, the individual will be awarded a Ranger Card and be authorized to wear the R/1 patch. The Ranger Card, issued by Wing Ranger Section only, will be carried at all times. Wing Special Orders for this award will be published.

1.4 ADVANCED RANGER (R/Ad)

Qualifications:

1. If a cadet, he must be participating and progressing in the Aerospace Education Program.
2. He must be actively participating in the Ranger Program.
3. Must be a Ranger (R/1).
4. Must have successfully completed an Advanced Summer Ranger School and an Advanced Winter Survival School. Serving on a School Staff in a command position shall be considered the equivalent of attending the advanced course.
5. Must have participated in a minimum of three Wing SARCAPs or REDCAPs with a Ranger Team or as Ranger Staff.
6. Must have prepared the lesson plan for, and taught, a one hour class on Ranger training as described in the Leadership Section (2.9). This is to be certified by the Ranger Team Commander or Squadron Commander. Certification and lesson plan will be submitted to Wing Ranger Section by the candidate.
7. Must have served as a Ranger Team Commander in the field for a 24-hour period. Certification, in the form of written orders for the assignment, endorsed by the Ranger Team Commander or Squadron Commander, will be submitted to Wing Ranger Section by the candidate.

Insignia and Award:

Upon completion of the above qualifications, the individual will be awarded the Advanced Ranger Card and be authorized to wear the R/Ad patch. The Advanced Ranger Card, issued by Wing Ranger Section only, will be carried at all times. Wing Special Orders for this award will be published.

1.5 EXPERT RANGER (R/Ex)

Qualifications:

1. If a cadet, he must be participating in the Aerospace Education Program.
2. Must be an Advanced Ranger (R/Ad).
3. Must possess a current Advanced Red Cross First Aid Card or have verifiable equivalent medical training.
4. Must have successfully completed the Special (third year) course at Summer Ranger School or the equivalent training given to second year Ranger Staff Cadets.
5. Must have successfully completed the Expert Ranger Physical Fitness Test (see Appendix 3) administered by Wing Ranger Section.
6. Must have demonstrated proficiency in handling firearms, either directly to Wing Ranger personnel or through achievement in the NRA marksmanship program.
7. Must have participated in a minimum of five Wing SARCAPs or REDCAPs with a Ranger Team or as Ranger Staff.
8. Must have demonstrated through his actions a continuing interest and outstanding ability in all phases of Ranger work, high moral qualities and a high degree of responsibility.

Insignia and Award:

Upon meeting all of the above requirements, the individual will be awarded the Expert Ranger Card and be authorized to wear the R/Ex patch. In addition, he will wear a black webbed pistol belt as part of his field uniform in recognition of his achievement. The Expert Ranger grade will be authorized by Wing Ranger Section only, and Wing Special Orders will be published.

SECTION 2
INDIVIDUAL SKILLS

Section 2 deals with those skills which, while not sufficient in themselves to create a smoothly-operating Ranger Team, are necessary to prepare the individual for team membership. While Section 3 focuses on those skills peculiar to the operation of a Ranger Team as a unit, this section focuses on you as an individual Ranger.

What individual skills are necessary to be able to contribute meaningfully to the total search effort? Since the Ranger will be spending much time in the field, he must feel "at home" there. It follows that an adequate indoctrination in the skills of woodsmanship is essential. Even the most proficient communicator or first aid specialist is, at best, seriously handicapped if he is not "in tune" with the very terrain surrounding him. Consequently, each Ranger must pay particular attention to all aspects of woodsmanship before he can maximize his contributions to the team. While some of the finer points of woodsmanship might seem, at first glance, too detailed for practical Ranger work, the whole unit is designed to mesh together and the end result (hopefully!) is a Ranger who is completely at home in the outdoors under any conditions.

Navigation is the art of moving from one point on the face of the earth to another by some systematic method, guided by a magnetic compass, terrain features, stars, or the like. Since much Ranger work involves treks into unknown territory - treks that must be made with pinpoint accuracy - the study of navigation is obviously relevant to both the team and the individual who must move through such territory. A careful study of navigation techniques and map reading pays additional dividends by providing training that can be invaluable to the individual experiencing survival conditions.

There is another reason, however, why each Ranger should master the art of navigation as well as every other individual skill in this manual. Even though you are not normally in a leadership position, your commander may someday have to point the finger at you and say, "Jones, take five men and check out this lead we just received." If you happen to be Jones and are suddenly handed a map, compass, a set of coordinates, and a time deadline, will you be able to accomplish the task? Each team member must make his goal the attaining of all the skills required of all the members of a well trained team. Although such versatility is rare in practice, the existence of only a few such versatile Rangers on a team tremendously boosts the capabilities of that team.

Among the skills of the individual Ranger should be a proficiency in first aid. The primary consideration here is the preventative aspect of first aid: the ability to anticipate and hence avoid accident-causing situations. While it is true that an important application of the Medical section is treatment of injured survivors, a yet more significant outcome

is the extra insurance that all team members will remain in top condition and free from disabling injuries, so that they can carry out their mission of mercy in an expeditious manner. It is the responsibility of each Ranger candidate to master first aid to achieve this end of helping, rather than hindering, his fellow team members in the pursuit of the mission.

CAP provides a program of physical fitness training for your use and it is especially important that all Ranger candidates follow this program on a regular basis. The Ranger that "poops out" or suffers a muscle strain is little help to a man dying of exposure somewhere on a mountainside - especially if the team is detained by having to return the "softie" to base. Further, a person in poor physical shape is a walking accident just waiting to happen. Fatigue causes one to be careless, and carelessness on a mission will invariably result in an accident which can easily divert an entire team from its assigned duty.

The Mobility section is logically related to woodsmanship and navigation. What is the best way to tackle certain obstacles which are in the path of a team? Under what circumstances might it actually be quicker (or safer!) to travel by a circuitous path rather than a straight-line route? These and several other questions are discussed under the heading of Mobility.

And then there is the question of survival. Stripped to its bare essentials, this section addresses the problem of staying alive in wilderness or storm until rescue can be effected. A survival expert must be a woodsman par excellence; he knows the secrets of the forest and wildlands and knows how to tap these resources to ensure his continued existence until help arrives. He becomes a master of improvisation. Most important, however, he learns to recognize dangerous situations and learns what inner resources he has that he can bring to bear on their solution.

Firearms familiarization is best seen in the context of survival. While CAP is not an armed branch of the military, proficiency in the use of firearms should be regarded in the same vein as proficiency in the use of an axe, knife, or any other basic tool of survival. Firearms are certainly one of the most effective tools developed for self defense, game procurement, and even signaling. Certainly no man can call himself a woodsman who is ignorant in respect to firearms.

A logical point of transition from individual skills to team skills is the discussion of Leadership. This section is designed to develop an appreciation for the delicate machinery which constitutes a smooth-running Ranger Team, along with the ability to keep that machinery in top condition at all times. You may never become a Ranger Team Commander, but by understanding some of the problems which confront the

CO, you will be able to contribute to the smooth operation of the team.

The Communications section serves a similar transitional function. By mastering the elements of effective communications, the individual Ranger contributes to the smooth operation of his team.

On an actual search mission, all team members have at least one goal in common: the accomplishment of their mission - swiftly - efficiently. The leader's primary responsibility is to keep all members steered in the direction of that goal. It is a big job, and requires the active and intelligent cooperation of every member of the team. Your proficiency in individual skills, and understanding of leadership problems will reduce the strain on the leader and allow both him and the team to do a professional job.

Now that the rationale of Section 2 has been previewed, it is time to begin intensive study of each individual sub-section. Be careful to note the cross-references within a given section, since much valuable information may be found in the footnotes and outside references. Some subjects can only be briefly touched on here, and the outside reading material specifically referenced in these instances is to be considered as an integral part of this manual for training and testing purposes.

SECTION 2.1
WOODSMANSHIP

It is the premise of this section that no Ranger can be fully effective without a firm foundation in the skills of woodsmanship. The cadet in training may have a superior background in navigation, communications, or leadership theory; yet, if he is completely untrained in coping with the physical environment in which he must exercise these skills, his effectiveness will be lost.

2.1.1 MISSION PREPAREDNESS

In the early hours following midnight, a ringing telephone disturbs the silence of your home. The message is terse and sobering: a mission is "on," and a vehicle will pick you up in ten or fifteen minutes. This leaves just enough time to dress and retrieve your pack from its storage place. Will you be able to make the deadline? A life might depend upon it!

To achieve "maximum readiness" the Ranger must anticipate and plan for such unexpected alerts. Three o'clock in the morning is hardly the best time to assemble a pack and ensure that all essential items are included, especially on such short notice. The solution is so obvious - yet, unfortunately, all too often neglected: the Ranger must have his uniform and pack accessible, assembled, and ready to go at all times. It is useful to consider equipment inspection and care as an integral part of every mission. That is, IMMEDIATELY FOLLOWING a given mission, each Ranger should clean his uniform and examine and repack all equipment used to ensure that they WILL be ready to go on short notice.

The average Ranger is responsible for three categories of items: uniform and outer garments, personal equipment, and food. With respect to the uniform, the following care is suggested:

- Launder and press all uniforms to provide long wear and a sharp appearance;
- Clean and polish boots for their protection;
- Hand-wash the Ranger cap and white pistol belt, when necessary;
- Occasionally, have outer garments dry-cleaned.

Concerning other equipment:

- Air-out sleeping bags, pack, tent and other equipment which may have absorbed moisture during use. Special care of the sleeping bag is discussed elsewhere in this

Section; however, an extremely important precaution is in order here. That is, sleeping bags should NEVER BE DRY-CLEANED! Fumes from most dry-cleaning agents are LETHAL and will linger in the bag for some time after the cleaning. Recently-cleaned bags have killed their users.

- Inspect cutting tools for nicks; clean and sharpen after each mission; and apply a thin film of oil to the cutting surfaces to protect against rust.

- Replenish first aid kits after each use. If Halizone tablets are part of the kit, be sure to replace them periodically, since their effectiveness diminishes with age.

- Thoroughly wash and dry eating and cooking utensils, canteen, and can opener before returning to pack.

- Carefully inspect Ranger rope for fraying or other signs of wear.

- Replace brillo pads, flashlight bulbs and batteries, and utility line, as needed.

After all equipment has been returned to top condition, it should be repacked and stored in a dry, accessible place. With these normal precautions observed, the entire team can be mobilized in a relatively short period of time.

Obviously, food constitutes one of the most important items in a Ranger's pack. All too often, however, an individual succumbs to the temptation of neglecting to properly replenish his food supply following a mission. The outcome of this neglect can range from mild inconvenience to a minor disaster. For example, in the excitement of an impending mission, it is easy to underestimate (or overestimate!) one's needs with respect to food. In this instance, either the Ranger goes hungry, or (in the case of over-packing) the extra weight represents an unnecessary and tiresome burden. Last-minute food selection can be inefficient in at least two other ways: in the first place, a pantry-raid will generally turn up only family-sized cans of goods, with a considerable amount of waste as a result. Secondly, hasty selection will likely lead to meals which are both monotonous and nutritionally unbalanced.

With the advent of canned foods, it is possible - with a little imagination and foresight - to assemble a food package which is efficient in every practical sense. Since on most REDCAPs the pace of activity declines considerably after the first day and a half or so, a logical food plan would include five full meals of non-perishable, ready-to-eat rations

- right from the can, if necessary (and it often is necessary!). These canned rations would then be "backed up" by an additional four to six meals in dehydrated rations. The latter definitely take longer to prepare, but their inclusion is justified by their considerably lighter weight, combined with the fact that time is usually less precious after those first thirty-six hours.

There are a few basic principles which should be kept in mind when assembling the food package. First, plan each meal in advance, and try to estimate how much of each food item will be consumed at a particular meal. Keep in mind that the high degree of activity during a typical REDCAP will require more food to satisfy body requirements than an average day at home. Then, if possible, buy cans holding as close to that portion as possible. In effect, each can should hold one serving: no more, no less. To help determine what kinds of food should be included to ensure nutritional balance, consult a copy of Boy Scout Handbook (Hereafter referred to as BSH). A section indexed "Menu" contains much helpful information concerning meal planning.

Fortunately, one-serving (eight to ten ounce) cans of many meats, vegetables, soups, and fruits can be readily obtained from most supermarkets. On the other hand, dehydrated rations are somewhat more difficult to obtain, and in addition are generally more expensive. The added expense is offset partially by the fact that they are much lighter in weight, however, and also that this portion of the food pack will seldom be touched.

For the emergency food pack, it is suggested that the Ranger avoid concentrated soups, since there probably will not be sufficient time to properly prepare such foods. This point is largely a matter of personal taste, though; a good piece of advice is to sample such soups in their concentrated form in advance, to see whether one can "stomach" the uncooked, concentrated rations. Creamed soups (such as cream of mushroom, etc.) can be especially annoying in this respect, and should be avoided.

As a good substitute for concentrated soups, most restaurants stock one-serving cans of soups which are already diluted to the proper consistency. Large supermarkets also often carry these "heat and serve" rations. For those Rangers who have never visited a large food store (and we suggest this in all seriousness), a trip through the local supermarket might be very revealing, in terms of what kinds of foods are available and adaptable to the particular needs of Rangers in the field.

A final precaution is in order: avoid any food which is stored in GLASS jars or bottles! Two unhappy instances come immediately to the mind of this author. In one case, a Ranger - an incurable catsup

addict - dropped his pack and discovered later, to his dismay, that the contents of the pack were completely covered with catsup as a result of the broken bottle. Catsup and other seasonings are prepared in small, aluminum-foil packages for restaurant use. A quick trip to the local restaurants might net enough such packages to last many camping trips ... and think of the weight that is saved! The other incident involved a broken bottle of orange juice; the victim had an uneasy sleep in a partially-saturated sleeping bag, as a result.

Since all items in the food package are either canned or dehydrated, the entire bundle can be stashed into the knapsack as a unit, ready to go on short notice. For training missions (where weight might not be a crucial factor), this emergency food package can be replaced with more perishable items - fresh foods, for example - since the latter can be refrigerated up to the time of departure to ensure freshness. Upon returning from the training mission, however, the emergency food package should be returned as soon as the pack has been restored to top condition. Finally, even if one does not resort to using the rations in the food pack, it is a good policy to examine all cans and packages to check that they have not been damaged in the course of the mission. Be sure to replace any cans or packages which show signs of breakage, since contamination and severe sickness might result from consumption of these rations. Be especially wary of damaged or swollen cans, for the same reason. Remember that, in freezing weather, the contents of some cans will freeze and expand, possibly to the point of breaking the seal of the container and permitting spoilage to occur.

2.1.2 EQUIPMENT NEEDS OF THE INDIVIDUAL RANGER

This section lists the equipment required of each Ranger during the conduct of field operations. The equipment lists provided in this manual have been demonstrated by experience to be the minimum equipment necessary for the members of a Ranger Team to be able to execute missions quickly and efficiently. Local conditions might warrant the inclusion of additional specialized equipment, however. For example, areas which usually experience heavy snowfalls would certainly require the addition of snowshoes for maximum effectiveness.

Appendix VII includes separate equipment lists for Summer and Winter use. However, for the purpose of this discussion a basic list of equipment is provided. This list includes the following items:

ON PERSON	IN PACK
1. Proper clothing	1. Pack Sack or Frame
2. Gloves	2. Sleeping Bag or Bedroll
3. Pistol Belt	3. Groundcloth

4. Knife
5. First Aid Kit
6. Canteen with Cup
7. Compass
8. Matches
9. Kleenex or Toilet Paper
10. Can Opener
11. Ranger Rope
12. Signal Mirror
13. Pencil and Paper
14. Personal Medication (Allergy Pills, etc.)

4. Poncho*
5. Jacket or Sweater
6. Spare Socks and Underwear
7. Fire Starters or Sterno
8. Waterproofed Matches
9. Mess Kit and Utensils
10. Brillo Pad or Equivalent
11. Food
12. Soap, Towel, Washcloth, and Toothbrush
13. Flashlight and Batteries
14. 25-Feet of Thin, Strong Rope
15. Hatchet, Machete, Shovel, or Axe
16. Insect Repellent (optional)

*The poncho is expected to double as both raincoat and overnight shelter. A Ranger may want to carry an additional overnight shelter, but this is not required. See description of shelter which follows.

As an expansion of the above lists, the comments which follow are included to help the Ranger candidate understand why certain items are required, what special considerations are necessary in selecting certain items, and the like.

Proper Clothing. Usually a fatigue uniform. Refer to Appendix 1. Also, check the most recent Ranger SOP for changes.

Gloves. Leather work-gloves are preferable; this item is a must for rope work and many other Ranger activities. For warmth under extreme cold, mittens should be included, in addition to gloves.

Pistol Belt. An Army webbed pistol belt: white for Ranger Base uniform; O. D. for field use. The following items are attached to the O. D. belt: canteen and cup, sheath knife, first aid pouch, and the Ranger rope. The pistol belt should be worn at all times in the field.

Knife. A knife is THE basic survival tool. Most Rangers carry two - a sheath knife and a pocket knife - although one SHARP knife is all that is required. Some suggestions:

Sheath knife - Four to six-inch blade length, sturdy handle, hilt, and sheath. Army trench knife or good quality hunting knife recommended. REMEMBER: a sheath knife should NEVER be worn on the front of the belt.

Pocket knife - Boy Scout type with can opener, etc. Get stainless steel blades, if possible.

First Aid Kit. Carried in pouch on belt; MUST contain a) water purification tablets; b) snake bite kit; c) antiseptic and bandaids.

Canteen With Cup. Army-style, one-quart canteen. A new type of canteen cover which clips over the pistol belt is sometimes available through Army-Navy Surplus outlets. This cover is desirable, since it prevents the canteen from flopping while the individual is running.

Compass. Army lensatic-type for navigation; any compass for survival. Many variations on the original lensatic compass are now available. The Ranger would be wise to read the appropriate parts of the Navigation Section before buying a compass.

Matches. MUST be waterproof. "Strike-anywhere" matches can be waterproofed by dipping the heads into airplane dope or melted paraffin (CAUTION: use a double-boiler for melting the paraffin!).

Kleenex or Toilet Paper. Oak leaves are a poor substitute!

Can Opener. May be part of a pocket knife.

Ranger Rope. A twelve-foot length of 5/16 or 3/8-inch nylon rope. This is a basic item of Ranger equipment, used for litter-carry, safety harness, Swiss-seat, and many others. The Ranger Rope may be dyed a distinctive color, if desired (use fabric dye at 180° Fahrenheit. Do not boil.).

Signal Mirror. Can be made by drilling a 1/8-inch hole through the center of a Boy Scout metal pocket mirror. For use of signal mirrors, consult Section 3.8 ("Signals") of this manual for instructions.

Pack Sack or Pack Frame. Best combination is a pack sack lashed to a pack frame. Army-type pack frames are often available through CAP supply. Boy Scout pack frames (aluminum and canvas) are somewhat lighter and more comfortable than the plywood and canvas Army-type.

Sleeping Bag or Bedroll. Down-filled sleeping bags are the lightest and warmest (and most expensive, as well). Dacron-filled bags are next best. Be wary of other, cheaper fillings, as they have a tendency to mat together, losing warmth. A

bedroll made from several blankets may be substituted for a sleeping bag.

Ground Cloth. Any lightweight, waterproofed material (for use under a sleeping bag). An old plastic shower curtain will suffice.

Poncho. The best outdoor rain garment. Doubles as an overnight shelter in a pinch.

Shelter. An additional shelter may be carried if desired: a pup tent, shelter half, or the like. Excellent shelter can be easily made from a light weight plastic sheet - see section on "shelter construction."

Fire Starters or Sterno. Although Rangers should be capable of starting a fire with wood under survival conditions, speed usually requires the use of solid fuel under normal field conditions. Tightly-rolled strips of newspaper soaked in melted paraffin make good fire starters.

Mess Kit and Utensils. Flat, Army-type mess kit with knife, fork and spoon (all stainless steel) stows conveniently in a pack and can hold emergency rations.

Brillo Pad or Equivalent. For cleaning mess kit. Wrap Brillo pad in aluminum foil and store it in the mess kit.

Spare Socks and Underwear. A fresh change for each day spent in the field. All extra clothing should be enclosed in a plastic bag and stored in the pack to guarantee dryness.

Jacket or Sweater. A warm jacket will ALWAYS be carried, even during warm weather. Nights often turn bitter cold, to the dismay of the unprepared.

Flashlight and Batteries. Rangers may need to use a flashlight all night during search operations. Hence, spare batteries are essential. Mallory makes a new compact pocket flashlight using long-lasting alkaline batteries (size AA) that reduces carrying weight. Flashlight should be the most accessible item in the pack.

Soap, Towel, Washcloth, Toothbrush. Cleanliness is next to Godliness. It also keeps you healthy and sweet (not sweat) smelling.

Thin, Strong Rope. Parachute cord is excellent. May be used to lash pack together, construct shelter, construct campcraft items, etc.

Hatchet, Machete, Shovel, or Axe. Each individual should carry one of these items, and an assortment within a given team should include at least:

4 Machetes
2 Entrenching tools
1 Axe - 3/4 size (Boy Scout Explorer axe).

Machetes should be left blunt for the first six to eight inches from the handle; the remainder of the blade should be well-sharpened. A dull machete slows down the entire team and is potentially dangerous. (See MOBILITY, Section 2.7.3)

Food For Three Days. Best Combination: canned foods for 36-hours' rations, lightweight dehydrated foods as emergency rations for the duration. Canned fruits are especially worth including, as are semi-sweet chocolate candies for reserve energy. Be sure that a balanced diet is included.

Insect Repellent. This item is optional, but strongly recommended. The repellent should contain diethyltoluamide as an ingredient. "Off" is one of the most effective repellents (it contains about 50% diethyltoluamide).

Boots. No low-quarter shoes should EVER be worn on Ranger missions. Black "jump boots" or hunting boots with rubber soles are best. Rubber-lugged soles give better traction than ordinary rubber soles. All leather boots should be water-proofed with a Silicone treatment. This should be repeated annually. Insulated rubber boots should be worn when the ground is covered with snow or the temperature is below 20 degrees. Army "Jungle Boots" are very good in hot weather.

2.1.3 GENERAL CAMPING SKILLS

Interest in camping and woodslore seems to have manifested itself for several decades, and perhaps it is on the upswing. As a result, there exists a large body of literature covering the topic - notable contributions have been made by the Boy Scout movement in this country, for example. In view of this wealth of reading material, this chapter will attempt to provide a reorganization of woodsmanship skills, with particular emphasis on the special needs of Rangers on field operations. After a few introductory comments concerning each area in woodsmanship, a set of references will be provided which will give the reader

more detailed knowledge concerning that particular area of training. Since these references will be given by topic (rather than by page number), the reader will need to consult the Index of the appropriate book in order to locate this information.

Before continuing, it is strongly suggested that the reader skim the pamphlet Camping (of the Boy Scout Merit Badge Series) to become familiar with the organization of that fine booklet. This will be necessary, since heavy reference is directed toward it throughout the remainder of the Woodsmanship Section.

Packing a Knapsack. The probability is great that, on the average REDCAP, the Ranger will not have to carry his equipment too far into the woods; often, the crash occurs within close proximity to a road. Then, why worry about how one's gear is packed? There are several reasons for concern over this seemingly trivial point. In the first place, although the AVERAGE mission may involve little or no trouble in "packing in" to the crash, there is always that exceptional case, involving a crash site far from passable roads. Preparedness for the worst, then, would avoid possible delay and probable discomfort to the Ranger. Second, experience at Training Schools and on any average SARCAP indicates that, even on short treks into the woods, there are several advantages to having a "properly" packed knapsack. Personal comfort is the first case in point; there are certain considerations which actually make a pack softer and less burdensome to carry. A related effect is that the Ranger who is weary from carrying his pack over a given distance has unnecessarily wasted energy that might be needed to be at maximum effectiveness when he reaches his objective.

Another consideration is DELAY: Improperly-packed knapsacks frequently come apart enroute, wasting more time and involving loss of important equipment in the process. Finally, there is the question of appearance. It must be kept in mind that Rangers often are in the public eye, and that the public's respect for C. A. P. authority is essential in, say, matters of security. But the public often has little opportunity or desire to make an accurate assessment of accomplishment; hence, it goes by what it sees. If it sees a dozen youths in shoddy half-uniforms carrying packs that are loose and disorganized, it is likely that the efforts of C. A. P. will not be taken very seriously.

A previous paragraph mentioned that there are considerations which actually make the pack less burdensome in the field. The first point is proper pack selection. Bradford Angier, a noted author in the field of woodslore and camping, makes the distinction between two basic types of packs: the alpine-type frame rucksack, which essentially is a canvas bag with several compartments and a built-in aluminum frame for rigidity; and what we might refer to simply as a packboard - that is,

that kind of pack whose basic element is a frame of wood or aluminum, upon which all other items are bundled and secured. A variation on the packboard idea is the addition of commercially prepared packsacks of canvas or nylon, with pockets to help keep the equipment separate and accessible. Pictures of these basic pack types are included in Figure 2.1-1.

Which pack will be most suitable for Ranger work? To answer this question, one must ask two more: what kind of terrain will the Ranger typically encounter, and how much gear (in terms of weight) will be carried on the average mission? Angier points out that the alpine-type frame rucksack is particularly suited to mountain climbing, especially if only a small load is being carried. Since the weight of this type of pack centers lower on the back, it is particularly easy to keep balanced. This property makes the frame rucksack particularly suited to mountain climbing, a sport in which the hiker needs to remain balanced with a minimum of effort.

However, many Ranger Teams will seldom encounter the terrain situations over extended distances that make the frame rucksack advantageous. This is particularly true of Rangers in the Eastern, Central, and Southern states. Further, the amount of weight typically carried by a Ranger is another consideration which makes the pack frame better suited to Ranger work. On a pleasure camping trip, a person might easily trim down his supplies to a very lightweight bundle (especially with the boon of dehydrated foods), and enter the wilderness for weeks with a minimum of weight. However, besides the personal gear that the Ranger must carry, he will probably find it necessary to haul additional items, as well: radios, medical equipment, and the like. In view of this, the packframe is most suitable for Ranger work. The disadvantages of this type of pack - its relatively high center of gravity, and its somewhat detrimental effect on balance - becomes an advantage in another sense: such a pack fits the back better (especially if one takes care to buy a good frame) and hence makes carrying heavier loads less unpleasant.

Pack frames are designed to carry weight high and fairly snug against the back. One must be careful to avoid an excessively topheavy condition, however. How can this be accomplished? Perhaps the best way to find out is by actually experimenting with different variations in weight distribution in your pack. Try to find the combination which affords a maximum of comfort, fits relatively snug, doesn't cause unnecessary exertion by being unbalanced, and doesn't impair one's ability to hold his head up and look around (some improperly-fitting or improperly-packed packs will do just this: the result is a stiff neck and a restricted ability to see where you are going).

Figure 2.1-1. Two Types of Backpacks.

Packboard on left is recommended for Ranger activities; Frame rucksack on right (discussed in text) is more suitable for mountain climbing.

Figure 2.1-2. The Lean-To Shelter

In walking while wearing a packframe, the Ranger will be leaning slightly forward to help let the weight distribute itself more evenly along the body. Some authors mention the use of a waist belt to fasten the pack more securely to the body, as a supplementary labor-saving device. These waist belts are particularly handy at times, but one caution is in order: if you are wearing another belt beneath (as you most likely will be, to hold up your pants!), be careful not to fasten the waist belt in such a way that it will bear down upon the trouser belt, causing possible irritation and restriction of blood circulation to the lower extremities.

Most authors recommend the use of foam rubber shoulder pads, to help cushion the bite of the pack straps. These pads can be purchased from many camping suppliers, and the price is usually so nominal that it is better to buy commercially-made products, rather than to make your own. Finally, mention is sometimes made of the "tump line" as a labor-saving device. The tump line really amounts to a headstrap, to which a line is attached and secured to the pack frame or load to be carried. If the load is particularly heavy, the use of a tump line is warranted. However, under normal circumstances with a well-packed packframe, such devices are not necessary. Angier refers to them as if they transform the camper into a beast of burden - and that's precisely what happens. Wearing a tump line necessarily restricts your range of vision to the ground immediately in front of you... not a very pleasant way to travel.

How should items be distributed on the packframe or in the packsack? One consideration must be kept foremost in mind: <u>accessibility</u>. One should be able to find quickly those pieces of equipment which are most often used. For this reason, it is recommended that a pack bag be purchased for the packframe. With a proliferation of pockets or compartments, one can stash all the items that must be readily accessible - such as the flashlight or poncho - in a place which doesn't require dismantling the entire pack to retrieve. Small cloth or canvas bags serve the same function of keeping the equipment into groups, thus enabling the Ranger to find a particular item more quickly, without having to "root through" the entire contents of the pack.

Aside from accessibility, the other consideration is <u>weight distribution</u>. Since the goal is to keep the center of gravity fairly high, Angier suggests placing items of increasing weight from bottom to top. Hence, the sleeping bag, being light, will be rolled and lashed (securely!) to the <u>base</u> of the packframe. Again, one should be careful to avoid making the pack <u>too</u> topheavy. How can this be done? Once more, experience is the best teacher. It is desirable to have the pack as <u>narrow</u> as possible, to avoid restrictions on swinging arms. Finally, Angier suggests that the weight of the pack be distributed as <u>close</u> to the

body as possible, for maximum efficiency... making sure, of course, that no irregularly-shaped (protruding) objects are placed next to the back to cause an annoyance and possibly an irritation. In the case where no frame is used, be sure to pad the part of the knapsack that will be in contact with your back, using a blanket or spare clothes package as a cushion.

How about the beginner in the Ranger program who cannot always afford to buy a quality packframe and sack? It doesn't require a great amount of skill to "do it yourself" - that is, to actually construct your own packframe. This matter is discussed in many books on camping and woodslore, including BSH and Angier's most recent book, Skills for Taming the Wilds.

To sum up: accessibility, weight distribution, and comfort are the major factors to reconcile when it comes to actually stashing equipment in the pack. At this point, it is in order to note that Bradford Angier does a fine job of articulating many of these observations (see List of References for more information). This excellent book deserves a place on the shelf of every real outdoor enthusiast - and particularly those who are in the position of instructing woodsmanship skills to Rangers.

Items to be included in the pack are listed under the appropriate summer or winter equipment lists in Appendix VII. For additional suggestions concerning the "proper" way to pack a knapsack, along with other useful information about packs, consult BSH (check the BSH Index for "Packs," "Packing," or similar references). The reader is also directed to the illustrations and text in Camping which relates to "Packs."

Finally, to ensure that the Ranger has a firm understanding of principles discussed in this and the prior section, he should be prepared to briefly explain the purpose for carrying each item in the pack (and on the person), as well as be able to discuss weight distribution, placement of items in the pack, and the use of labor-saving devices, such as waist belts, tump lines, and shoulder pads.

Campsite Selection. Although the typical mission does not leave much choice concerning the general location of the campsite, several factors should be kept in mind to maximize comfort and safety. Some of these include location with respect to trees and prevailing wind, availability of water and firewood, and the presence of terrain factors such as gullies, slopes, cliffs, swamps, and the like. Type of prevailing ground cover can often make the difference between a wash-out on one hand, and dry comfort on the other.

From a slightly different viewpoint, one might ask the following questions of his proposed campsite: Is there any chance that boulders

or even smaller rocks will become dislodged from a nearby cliff or steep slope, causing danger to the users of a given location? Are there any large trees with dead branches, or dead trees, for that matter, which might crash down upon the bivouac area? Is the site selected in an area sufficiently high (away from gullies and small streams, for example) so that a sudden rainstorm and possible resulting flash flood will not affect the safety of the campers? The point here is to avoid camping immediately next to a small stream or a gulley, unless the bank is quite high. Heavy rains or sudden warm-spells, especially in late Winter or early Spring, can swell a stream to flood stage in a surprisingly brief period of time.

Is the site located far enough from swamps, wet areas, stagnant water, and dense foliage to minimize intrusion by insect pests? Keep in mind that insects are often carried long distances by the wind. Hence, one should take into account the prevailing wind and locate his site on the upwind side of such sources of insect pests. Is the campsite close enough to a supply of firewood and (if possible) running water? Is the ground level enough to afford comfort and ease in shelter construction, yet not so completely flat that proper drainage is retarded? Is the ground cover sufficiently deep to absorb any rain that might occur? These and other questions should be in the mind of the Ranger who is charged with the responsibility of selecting a suitable campsite location, whether he is on a REDCAP, SARCAP, or a routine training mission. Further, in selecting a "proper" campsite, many potential problems of health and safety will have been eliminated, making the successful accomplishment of the mission more probable.

All Rangers should read the fine discussion on campsite selection in BSH (indexed as "Campsites" or "Campsite, selection of"..) Similar information can be found throughout the text of Camping, as well. (Some editions of Camping devote an entire chapter to the topic of campsite selection.)

Shelter Construction. After selecting the campsite, the construction of some form of shelter is the next logical step. Several types of shelters should be familiar to the Ranger, in order that he might make the best of any situation. His training should include a knowledge of paratepee construction, wall tents, Baker tents, wedge (including pup) tents, and trail tents. He should also be able to improvise shelters from ponchos, tarps, and natural materials.

This section discusses the construction of a few basic types of shelters - namely, simple poncho shelters (lean-tos and wedge-type), plastic tarp shelters, and paratepees. It is expected that the Ranger become familiar with all types of shelter mentioned in the preceding paragraph, as well as those which follow. References for those types not discussed in detail can be found at the end of this section.

Poncho Shelters. Perhaps the most elementary type of shelter available to the Ranger is the poncho shelter. Since every Ranger carries the necessary raw materials at all times - namely, line and poncho - as part of his basic equipment, any well-equipped Ranger who uses a little ingenuity always has a shelter available to him.

The Lean-To. A simple lean-to can be constructed by lashing a pole, called a cross-pole, between two trees and attaching the short side of a poncho to it, as illustrated in Figure 2.1-2. This shelter is probably the best single one-man arrangement which can be devised from a poncho. The tail end of the lean-to is fastened securely to the ground with stakes and line, and the shelter is constructed so that any wind will come from the rear of the lean-to and will thus be broken by the shelter. If further protection from the sides is desirable (as would be the case with shifting winds), pine branches, or even snow in Winter, can be arranged to block the flanks of the lean-to. It should be mentioned that a piece of shroudline stretched tightly between two trees could be a substitute for the cross-pole mentioned above.

Although the most elementary form of lean-to can be set up without cutting any wood, a more stable version would be one that has ribs to help support the shelter material in case of heavy wind or (more importantly) rain or snow. These ribs consist of several parallel poles running lengthwise from the cross-pole to the ground at the foot of the lean-to. Cross-members might be attached perpendicular to these ribs to help keep the ribs apart, but such cross-members should be attached to the underside of the ribs to prevent the formation of puddles in case of rain or snow.

In the same spirit, it helps to stretch the poncho reasonably tight over the ribs, in order to ensure rapid runoff of any precipitation reaching the shelter. Finally, be sure that the neck of the poncho is sheltered (with the back of the hood on top, draped downward over the opening) to keep rain out of the shelter.

Wedge-Type Shelters. Ponchos (and tarps, as well) can be converted into wedge shelters very quickly by first stretching a piece of shroudline (or Ranger Rope) between two trees, a few feet above the ground. The distance between the trees should be about eight or nine feet. The poncho is then unsnapped to form a large rectangle. The only really practical variation on this shelter involves snapping two ponchos together, forming a largerrectangle. (See Figure 2.1-3). The joined ponchos are draped over line in the manner illustrated, again being careful that the necks of the ponchos are positioned in such a way that they will not admit rain into the sheltered area. It is advisable to stake-down the edges of the shelter, rather than weigh them down with rocks or logs, since the latter method invariably wastes valuable canvas and consequently provides a smaller shelter area under the wedge.

Constructing Wedge-Type Shelter from Ponchos

The Experienced Woodsman Demonstrates Spaciousness of the Shelter

Figure 2.1-3. Wedge-Type Shelter

Such shelters are appropriate if no reflector fire is needed for warmth. Be sure to erect the shelter perpendicular to the prevailing wind, however. Otherwise, the "shelter" might be quickly converted into a small, wet wind tunnel, in the event of a sudden storm.

In constructing the wedge-type shelter with ponchos, the Ranger usually would want to tack down the edges securely to the ground, to keep out rain and cross-winds. However, in fairly warm weather with low probability of rain (or in light rain, at worst), the individual might decide that more headroom is desirable - at the calculated risk of getting drenched by a sudden storm. In such an instance, the wedge shelter can be constructed with a higher apex and with the edges a foot or two off the ground, affording somewhat more space underneath. Figure 2.1-4 illustrates such a shelter. Remember that such variations would be very unsatisfactory under conditions of high wind or driving rain, for obvious reasons.

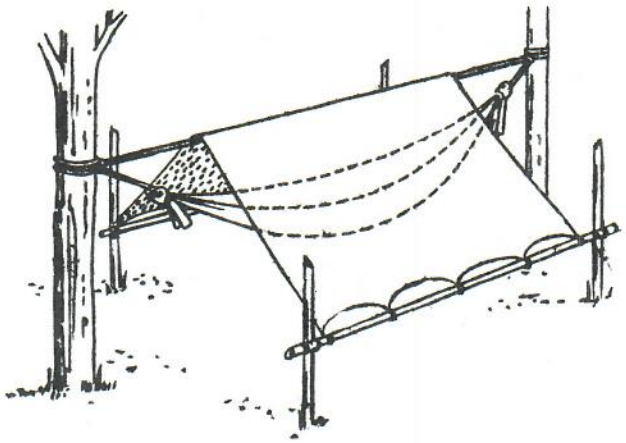


Figure 2.1-4. Suspended Wedge-Type Shelter

Plastic Tarp Shelters. Under some circumstances it is expedient to keep the poncho ready for action. In such cases, use of ponchos for shelter might result in an uncomfortable situation - for example, when the Ranger is forced to break camp (or set up camp!) in a driving rain. In any case, a very worthwhile investment would be a large piece of plastic (polyethelene) tarp, with dimensions at least ten by twelve feet. It is essential to select a heavy gauge of plastic - about four to six mils - the kind that is frequently used in construction or farm work (to keep out wind and rain from work areas, or to cover lumber, hay, or other materials, for example). Such heavy gauge plastic can be bought from lumber yards, farmer supply stores, construction suppliers, and similar outlets.

Plastic tarps are generally available in black or clear. Black has the advantage of being opaque: this means more privacy, and also

shelter from early-morning sun for late sleepers. It also means more warmth in summertime, however, since a black surface absorbs heat more readily than a lighter one. Further, one of the advantages of opaqueness can be seen as a disadvantage, as well; namely, the black plastic will admit less light and hence make operations within the shelter less convenient. If privacy is not all that important, and if one is not a late sleeper, the best choice would be clear (which after a few uses becomes a bit clouded, anyway).

In selecting the plastic tarp, keep in mind that lightweight plastics tear quite easily and should be avoided. On the other hand, a good heavy gauge of polyethelene tarp, as discussed, can be preserved for years, with reasonable care.

Such tarps have several advantages over conventional shelters: they are completely waterproof; very inexpensive (two dollars or so should buy plenty); lightweight; mildew-proof; quick-drying; resistant to flame (although sparks from a carelessly built fire will melt holes through the plastic); easy to repair, if one had the foresight to bring along a roll of adhesive or plastic tape; and light-admitting, at least in the case of the clear type of plastic. Further, if the tarp is cut large enough, one has, in effect, a built-in groundcloth. The disadvantages associated with plastic tarps include the facts that they are less tough than canvas; they do not "breathe" in the same manner as canvas (which means that the user must ensure adequate ventilation); they become a bit stiff in cold or rainy weather; and in high winds they are - to some people - a bit noisy. Finally, plastic tarps will "sweat" on the inside, under certain climatic conditions... not enough to drip, in most cases, but enough to cause slight annoyance in close quarters.

Plastic tarps are extremely versatile; they can be erected in the same manner as poncho shelters and lean-tos, as well as in a variety of other ways. Actually, with a large enough tarp, a knowledge of the button technique for fastening lines to the tarp, and a little imagination, the individual can make almost any type of tent desired.

Probably the easiest (and most common) application of the polyethelene tarp in shelter construction is the simple lean-to. Details of construction of the lean-to are described in a previous part of Woodsmanship. Several advantages of using a tarp (instead of a poncho) have already been discussed; one more is the fact that a large tarp will provide sufficient excess ("overhang") on one or both sides to protect the occupants from cross-winds. This overhang is fastened to the ground either by means of tent pegs (using the button technique described below to fasten tentline to the tarp), or by tucking the excess tarp under long logs selected for the purpose of weighting down the loose tarp.

Indeed, with a little imagination and teamwork, several Rangers can construct a very satisfactory shelter by "pooling" their tarps and groundcloths. One 10 x 12 foot tarp will provide an overhead shelter twelve feet long (with no overhang on the sides). Since this would provide enough overhead shelter for three or more Rangers, including their gear, another tarp of similar size might be used as the groundcloth for the entire party. If shelter from sidewinds is needed for such a shelter (which isn't often the case), one of the group might relinquish his groundcloth - a required item of Ranger equipment - to plug the troublesome gap. The result will be a sizeable lean-to with shelter on both sides, and adequate protection from the damp ground beneath... all without "tying up" the poncho at all!

In constructing such tarp-shelters, a few extra considerations will contribute to your warmth and comfort. If heavy snow is expected, be sure to erect the shelter in such a way that the sides and top are fairly steep, to prevent the accumulation of heavy snow and the possible collapse of the shelter. Further, in selecting cross-poles, logs, or other framework for tarp shelters, one must exercise particular care in smoothing-over or otherwise removing all protrusions from the wood, so to protect the plastic from punctures. Of course, all irregularities on the ground should have been cleared in advance of erecting the shelter. Since the front of the shelter is open, one or more small reflector fires can be built to add warmth. Finally, some form of bedding should be placed on top of the plastic groundcloth, since the plastic will keep out only moisture, not cold.

Since the plastic is virtually waterproof, contact with it will not cause leaks in rainy weather (as would be the case, were the shelter material canvas). However, some condensation will form on the cold plastic. Although the accumulation of this moisture will not typically be sufficient to cause a problem, contact with the surface on which the water has condensed can cause an uncomfortable wet-spot on clothes or gear. This is another good reason for using bedding material (or, at least, a blanket) to cover the floor of the shelter.

As a digression, it might be pointed out that this "grouping together" mentioned above is a most efficient way of employing individual equipment. It is a far better arrangement than requiring each individual to construct his own shelter, and the teamwork involved in constructing a shelter jointly not only saves much time, but also generates (or fosters) a sense of cooperation that is vital to the functioning of a TEAM. There are all kinds of by-products, as well: for example, a team might be engaged in securing the wreckage of an aircraft, in which guard shifts of three Rangers are required throughout the night. In this case, the occupants of a given shelter could constitute such a shift, making it easier for the previous shift to locate and wake the entire shift, without disturbing other sleeping individuals in the process.

The Button Technique. Plastic tarps (and sometimes ponchos) are not supplied with built-in grommets - that is, reinforced holes to which one fastens a tentline. But it isn't usually necessary to go to the trouble of installing grommets, especially in plastic tarps. How, then, can one fasten such material to a cross-pole or to a stake in the ground? The solution is easy. First, choose a few small SMOOTH pebbles, about the size of a large acorn. In the absence of smooth pebbles, a piece of branch whittled to size, or an acorn, for that matter (with the sharp "peak" shaved off) would be a good substitute. Next, with your thumb, make a small pocket in the material to be buttoned (see Figure 2.1-5). Insert the pebble in this pocket, and tie the pocket closed around the pebble, using two half-hitches or some other suitable knot. The other end of the line is simply fastened to the stake, cross-pole, or wherever desired. Again, it is apparent that ordinary, lightweight plastic will not withstand much tension, and hence would be unsatisfactory for use as a shelter. Commercially prepared buttons, called "visklamps," are often available through camping supply outlets or mail-order houses dealing with camping equipment.

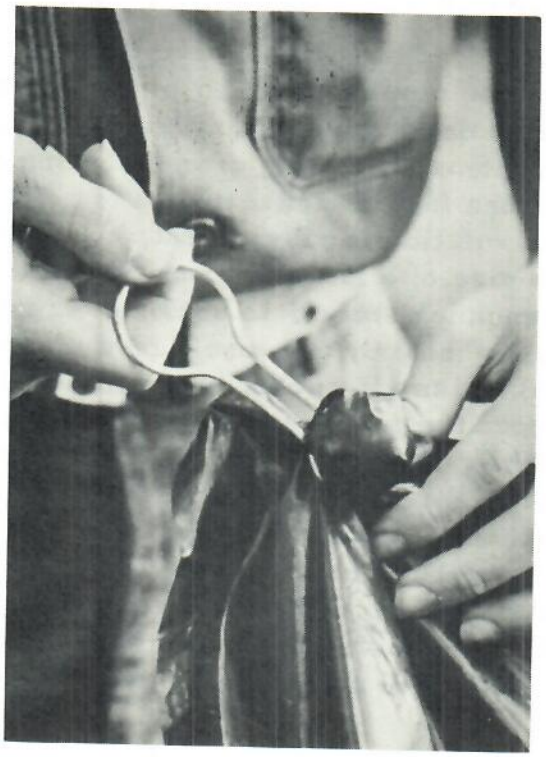
Parashelters. A very serviceable shelter can be constructed with a surplus parachute. The paratepee, as one such shelter is called, offers several advantages: one can stand up inside, making a change of clothes easier; and a small cook-fire can be built in the center, serving also to keep the shelter warm. Obviously, one should take care to keep the fire SMALL and in the center, using hardwood which produces a minimum of sparks. Such a fire can also be used for drying clothes, and the use of a fire in a parateepee creates a beacon effect at night, which is worth remembering for survival purposes.

However, parachute shelters have a few disadvantages. For one, they often fail to keep moisture completely out during a heavy or lengthy rain. One way to maximize the water repellency of a parachute shelter is to stretch the material as tightly as possible, so that the rain runs off as soon as it hits. Another method involves making a double layer of material, separated - when possible - by air space. Both layers are tightly stretched, of course. Moreover, this latter method provides some benefit of additional insulation in the form of dead-air space.

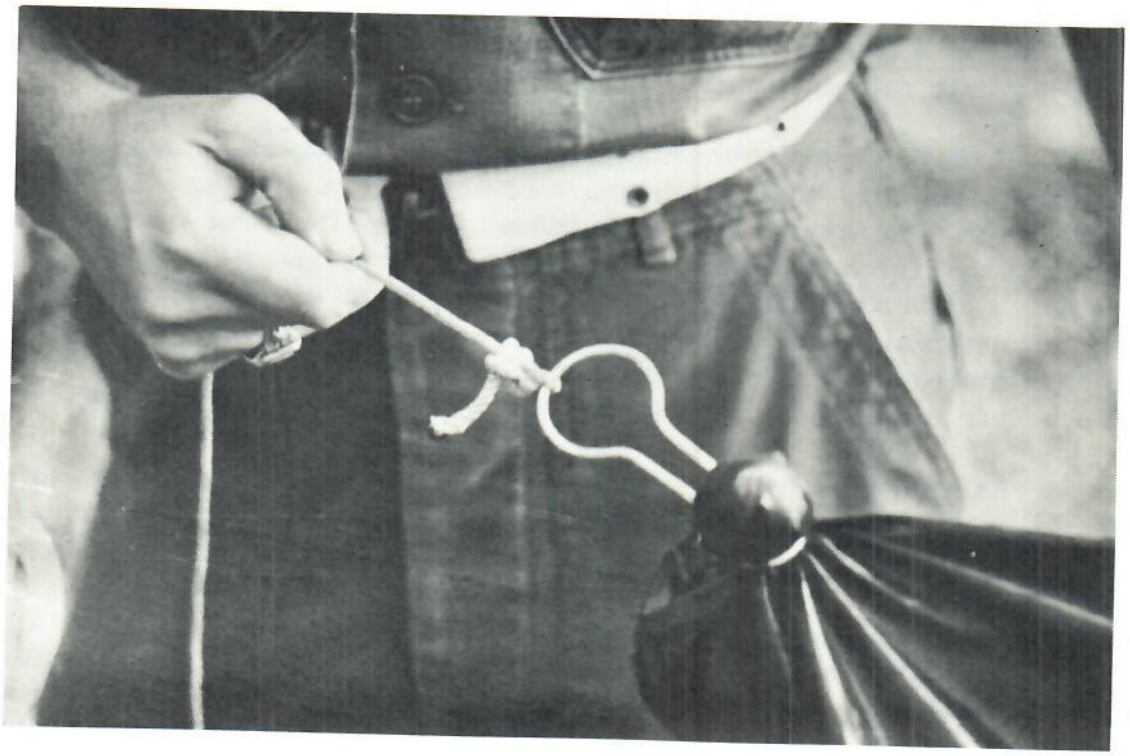
Another disadvantage is the flammable nature of parachute material. Spark showers from a fire will easily melt through the material, causing leak holes. In addition, an improperly-built fire might actually ignite the material, causing obvious danger to the inhabitants.

On many Ranger operations, parateepees are particularly suitable, in the absence of larger tents, around a base of operations, or on training missions. Even on clear summer nights, a sudden drop in temperature can cause extensive condensation of water vapor in the air.

Small Pebble (or Substitute) and Visklamp



The Assembly Procedure

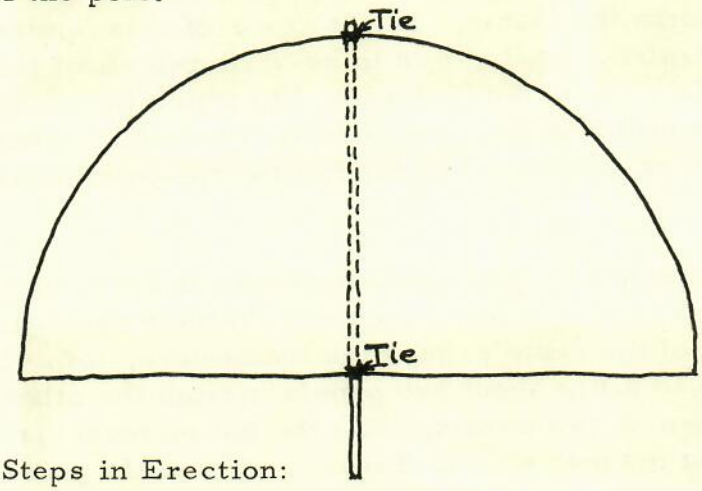


The Final Assembly

Figure 2.1-5. The Button Technique

Such condensation, taking the form of a heavy dew, can literally drench unprotected clothing, equipment, and sleeping bags. Since bases of operation are often located in relatively open areas, paratepees are welcome shields against such conditions.

Rangers should learn two basic variations of the paratepee: the one-pole parashelter, and the frame (or tripod) paratepee. The one-pole shelter, although somewhat flimsy in construction, can be erected fairly quickly. First, cut a very long pole (about twenty feet or so) and trim off all protrusions. Next, spread the parachute flat on the ground to form a large circle. Since only half of the chute is actually needed for this and the following shelter, fold the chute to form a semi-circle, as illustrated in Figure 2.1-6. The long pole is attached to the chute in two places - first at the apex of the chute (that is, the original center of "hole" of the chute), and next to what will become the base of the parashelter. This base, called the skirt, is attached to the base end of the pole.



Steps in Erection:

1. Spread chute on ground. Double back to form a semi-circle.
2. Tie pole to the chute at the edges shown.
3. Apply pole to the tree.
4. Stake down chute to form 12' circle on the ground.

Figure 2.1-6. The Single-Pole Parashelter

At this stage, the chute is ready to be erected. Lean the top end of the pole (that is, that end which extends beyond the apex) into the fork of a nearby tree, forming an angle of about 60 degrees. Finally, stake down the skirt of the chute to form a circle of about twelve feet in diameter. If desired, one can allow some overlap when the circle is completed, to form a door flap. This flap can be secured to the body of the parashelter, using the button technique described above.

If twenty-foot poles are not readily available, nylon shroudline stretched very tightly, or heavy rope, may be used as a substitute. In this case, it is only necessary to tie one end of the line to the apex, while tossing the other end over an overhanging branch and securing to the proper height.

Since this type of shelter is necessarily constructed near or actually under large trees, be careful to visually inspect the nearby trees for large, dead limbs or signs of weaknesses which might endanger the occupants of the shelter in a sudden storm.

A more suitable parashelter for general purpose is the tripod paratepee. Such a shelter can be constructed in the open, if necessary, and is much more rigid than the one-pole parashelter described above. Figure 2.1-7 illustrates the construction of the tripod paratepee. First, the parachute is doubled over, leaving a semicircle of fourteen panels. Cut all apex lines, except for the middle two. Select nine smooth poles about fourteen feet long to form the frame. Pick three of these poles and make a tripod, as illustrated, leaving five to be arranged about the erected tripod, and one to serve as the "tie-pole," to which the chute will be attached. The bases of all the poles will form a circle of about twelve feet in diameter. The parachute is secured to the tie-pole in the manner illustrated.

At this point, the parachute is applied to the frame in the following manner. First, place the tie-pole in place opposite the door opening. Next, bring each outer edge of the chute around the framework, toward the door. Tie one outer edge to a line about two panels in from the other outer edge, leaving an overlap of two panels. Use the button technique to secure the two ends, in the manner shown. Finally, spread the poles outward to stretch the chute material tight, and tie down the skirt to stakes driven into the ground.

If a fire is to be built inside, a slight modification of the opening can be made to form "smoke wings" for releasing the smoke. This modification is detailed in Figure 2.1-7.

Many additional types of shelter can be constructed from the parachute or from tarp tents or natural materials. Some of these are illustrated in AFM 64-3, and AFM 64-5. Also, valuable information concerning shelter types and shelter construction can be found in BSH, indexed under "Tents" and "Camping" (with subsections such as "-bed making, ""-making camp, ""-winter." Camping also covers this subject of types of tents available, along with useful tips for their erection.

Bedding. Besides affording a certain measure of comfort, a very important reason for constructing bedding is to provide insulation from

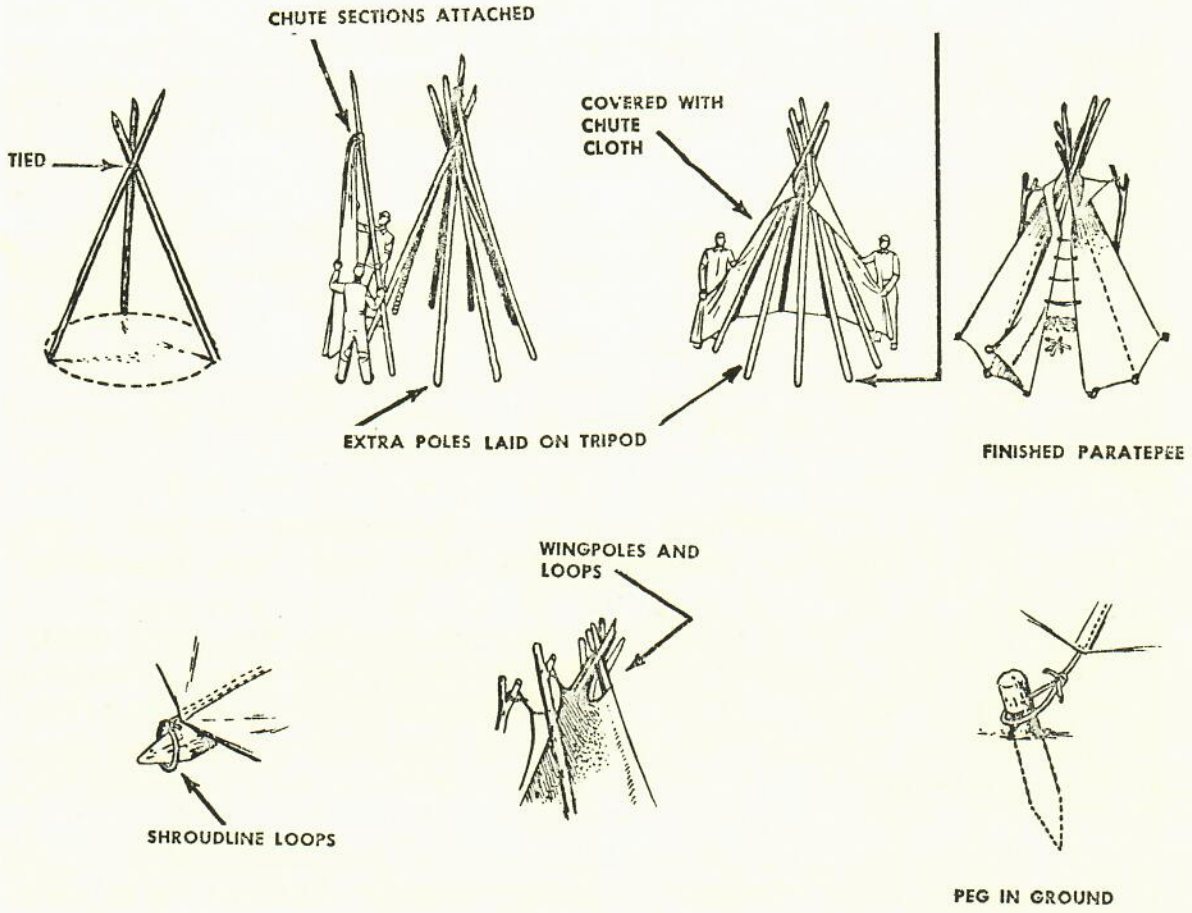


Figure 2.1-7. Construction of the Tripod Paratepee

cold or damp ground (or snow). Like a sleeping bag or good winter clothes, the objective is to achieve a certain amount of dead air space between yourself and the ground to retard loss of heat into the ground. A number of methods of achieving this end can be found, but we prefer to consider only the following three.

The first method requires that the Ranger carry a lightweight, small-mattress-sized cloth bag along with the rest of his equipment. This bag, very lightweight and taking little space in the pack, is then stuffed with pine boughs, dry grass, dry leaves, or some other suitable mattress material. As is the case in constructing any natural bedding, the Ranger should take care to remove all rocks, twigs, and protrusions in the ground upon which the mattress is to be placed. He might also dig shallow shoulder and hip holes, if mattress material is particularly scarce. An important consideration is the use of DRY bedding material. After all, one of the reasons for going to the trouble of preparing bedding is to escape a cold and usually damp ground.

A second type of bed can be made by placing four logs in a rectangular fashion - like a picture frame - with enough space between the logs to stretch out. This space is then filled with any suitable dry mattress material, preferably pine boughs, to a depth of a foot or two. Incidentally, when removing pine boughs from the tree, be conservation-minded. Do not strip the entire tree, but rather, take only a limited quantity from the LOWER branches from several trees. Upon reaching maturity, these trees will lose their lower branches anyway, and by taking the boughs from many trees, it is unlikely that any one tree will suffer permanent damage. Finally, when removing pine branches, make a clean cut with your knife or machete. Avoid peeling strips of bark off the remaining tree, since such practices expose the tree to disease and insect infestation.

A third type of bedding is arranged by securing a large quantity of evergreen boughs, and then arranging them row by row, forcing the "stick" ends into the ground. Several layers can be accumulated in this manner, and the result is an extremely comfortable form of bedding. The disadvantage, of course, is time: such beds take so much time to construct that they are impractical for typical ranger activities. The primary purpose of learning this type of bed construction is for use under survival conditions.

At this point, an old woodsman's trick is passed along. It has been frequently asserted that a major purpose of bedding is to provide insulation from cold and damp ground. Some campers attack the problem in a different manner: by actually warming the ground. This can be accomplished by simply building a fire across the bed-down area (after taking all usual precautions in building such a fire!) and, after a short time, scraping all embers away.

A better method, however, is to scrape a shallow trench in the earth - perhaps a foot or so deep - building a fire in that trench, with a number of rocks in the fire (be careful about selecting the rocks to be heated, since certain types which are porous may explode, due to expanding water vapor!). After the fire burns down, remove the coals and embers, and cover the rocks with the earth which has been removed to make the trench. The earth which had been removed, being close to the fire, will have dried somewhat as a result of proximity to the fire. But, more important, the dried, warmed earth within the trench, along with the hot (covered!) rocks, will retain heat for a considerable length of time.

As has been implied by the foregoing discussion, it is more important to take care in insulating oneself from the under side, since body weight compresses the sleeping bag material and thus permits the loss of heat into the ground more readily than into the air above. A good

investment which will ensure reasonable comfort and separation from the ground with a minimum of effort is a 1-inch thick piece of polyurethane (foam rubber) pad, about shoulder width (for ease in packing) and length depending upon the size of the individual. While such pads are a bit bulky, they can be rolled up and lashed to the packframe with relative ease. The insulating properties of the foam, along with its low weight and high durability (one piece will outlast many air mattresses!) make these mats a worthwhile addition to a serious camper's stock of equipment.

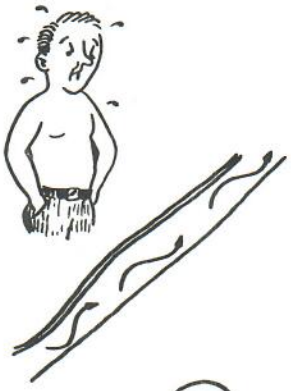
While air mattresses seem to be becoming a thing of the past among more experienced campers, enough are yet in use to warrant the following comment. When using an air mattress, it is essential to carry an extra blanket to place between the mattress and the sleeping bag, to provide further insulation from the cold plastic which makes up the mattress. In addition, some mattresses, especially the cheaper variety, are highly susceptible to punctures. Consequently, one should be certain that the ground immediately beneath the sleeping area is completely free of sharp rocks, stones, twigs, and the like. To return to the topic of insulation, another good insulator is newspaper. Newspaper has the added advantage of being cheap and flammable, so that one only has to worry about carrying the paper into the camp area, not back out.

The Sleeping Bag. Probably one of the most important items of camping equipment - and most likely, the most expensive as well - is the sleeping bag. Hence, careful consideration should be given to its selection. Some useful suggestions along this line, along with a discussion of the construction of bedding, what to wear when sleeping, and care of sleeping equipment, can be found in Camping. Further, Figure 2.1-9 has been included to help develop an appreciation for certain principles of insulation. Since this information applies both to the selection of clothing and sleeping gear, it should be given careful consideration by the reader.

It is recognized that many Ranger candidates cannot afford the initial high expense of a good sleeping bag. In such cases, rather than compromising and buying a "moderately" expensive bag, it might be wise to improvise until enough money has been saved to buy a good bag. Ways in which blankets can be used to make a "bedroll" are discussed in BSH.

A final comment concerning bedding is offered: When it is not important that the shelters be neatly arranged in a small group, the following tip is passed along by an experienced camper. In wooded areas with fairly absorbent ground cover, look for slight depressions in the ground - the ideal size may be not much larger than the area covered by a standard pup tent, and only a few feet deep. Such depressions accumulate layers of drifting debris, such as leaves and soft pine needles, and

Clothing Yourself To Keep WARM



THE HEAT AND MOISTURE FACTORY

Your body burns food to produce from 2400 to 4500 calories of heat a day and about two pints of water in the form of insensible perspiration. To keep warm, heat must be conserved and water vapor carried off without passing into the clothing layers.

THE VENTILATING LAYER

How do you get rid of 2 pints of water without it soaking into your clothing? Ventilation is the answer! Successful ventilation requires two conditions: first there must be space next to your skin for air to circulate; and second, air must be free to enter your clothing, usually at the wrists and pants, cuffs and waist—and leave at the neck. Genuine net underwear with holes larger than ¼" will take care of the ventilating layer. Avoid underwear that clings to your skin and wicks the moisture into your clothing.

COMFORT-UTILITY-DURABILITY

Next layer consists of more or less conventional clothing: the wool shirt, the heavy trousers. Prime considerations here are comfort, utility and durability. Wool or some of the new synthetics in a spun fiber are good because they don't mat down and they stay warm when wet.

YOUR INSULATION

The insulation is your most important layer, and the most important thing to remember about insulation is thickness. Actually, dead air does the insulating and any material that will stop the circulation of air inside your clothing will be effective insulation. It could be steel wool or the best grade of down. Down is an ideal insulator for two good reasons: one, to insulate a certain thickness requires fewer ounces of down than any other material; and two, it is much more compressible. Compare a 1" thick nylon jacket filled with down and a heavy sheepskin coat and you understand the importance of the down characteristics.

For a given temperature and activity level you need approximately the thickness shown in the table. Note that a garment designed for lower temperatures requires thicker insulation. For warmer temperatures, the same garment must be able to circulate air through cuffs and the neck to provide additional ventilation.

Temperature	Sleeping	Light Work	Heavy Work
40° F	1.5"	.8"	.20"
20° F	2.0"	1.0"	.27"
0° F	2.5"	1.3"	.35"
–20° F	3.0"	1.6"	.40"
–40° F	3.5"	1.9"	.48"
–60° F	4.0"	2.1"	.52"

U. S. Army Quartermaster data. Use as a guide only.

THE OUTER SHELL

To keep the weather out of your insulation, you need a windproof, water repellent outer shell. Sometimes this is provided in the outer covering of the insulating jacket, but more commonly it is supplied by an outer wind parka capable of being completely sealed around wrists and face. If the wind is allowed to penetrate the outer layers of your insulation, it reduces the effective thickness. Rainwear also belongs to this category when there is danger of your insulation becoming wet.

Figure 2.1-8. Quoted from "Gerry" Catalog by Gerry Cunningham.

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hence form a natural bedding (so natural, in fact, that deer often bed down in such depressions). A tarp or lean-to can be erected with relative ease over such depressions for protection against precipitation, and the depression itself affords shelter from wind. Obviously, such depressions (not to be confused with gulleys!) in hard ground with little cover would be unsuitable, as they would be likely to fill with water in the event of rain. Hollows in rocks are similarly undesirable, and they present the additional danger of snakes hidden in crevices. But a reasonable amount of ground cover will absorb all but the heaviest and longest of downfalls, and there is little danger of being flooded out of such a spot.

Winter Camping Conditions. Throughout the course of this section (and particularly, throughout the referenced reading assignments in BSH and Camping), special considerations were mentioned concerning winter conditions. This section has been included to help "zero in" on some of the more important problems involved, along with suggested solutions.

Winter Travel. The section on Mobility will address some of the problems posed by snow and ice in terms of travel, and the Hiking subsection mentions precautions one can take to minimize chances of becoming frostbitten (see also the Medical section for treatment of frostbite). The principal concern at this point relates to travel itself, the clothing worn, and "survival" under arctic conditions.

Figure 2.1-8, in this section, illustrates the importance of choosing clothing which, on one hand, provides sufficient dead air space to insulate the body from cold, yet on the other hand, provides an outlet for moisture given off by the body in the form of perspiration. Choice of proper clothing, then, is an extremely important prerequisite to winter comfort when on search and rescue missions. Specifically, what special clothes are appropriate for winter wear? Since conditions vary so greatly from one locale to another, only the most general comments are appropriate here. Appendix VII provides a list of typical winter equipment, along with some comments concerning their use. A good suggestion, especially to the newcomer of a particular area, is to seek advice from the natives concerning appropriate wear for various seasons of the year. Seek out the real camping enthusiasts of an area (not the trailer-camper breed, but the real woodsmen!) and glean all information possible from the more seasoned of them.

Other considerations when under arctic conditions are the rate of travel (on foot), the type of terrain encountered, and the type of work in which one engages under winter conditions. Active movement generates body heat and, consequently, a person "on the move" will require less insulation than an individual who is stationary - on guard duty, for example. If much travel is necessary, it is essential to be sure that you (and your troops) avoid becoming overheated which, in turn, causes

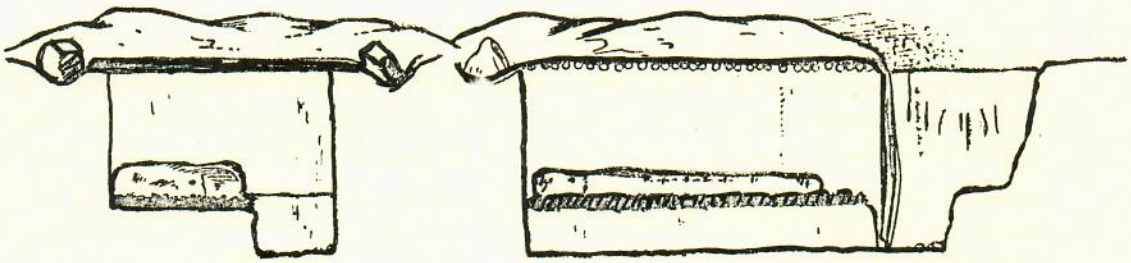
excessive perspiration. This can be accomplished by taking frequent breaks, during which individuals can open their jackets to ensure adequate dissipation of water vapor (which would otherwise accumulate as moisture, with the danger of turning into ice at a later date!). Further, one might avoid this possibility by planning extra time for breaks and slower travel.

If the Team is on the move, it would be a good idea to remove a layer or two of outer clothes to prevent overheating and excessive perspiration. The same principle holds true when the individuals are engaged in vigorous physical activity, such as wood-chopping. Under such conditions, the philosophy of wearing several layers of clothing, rather than merely one heavy outer garment, is twofold: first, several layers generally provide much more dead air space, and hence have better insulating properties. Second, one can readily peel off layers (or add them!) with changes in climatic or work conditions, enabling the individual to adapt readily and thus keep warm at all times.

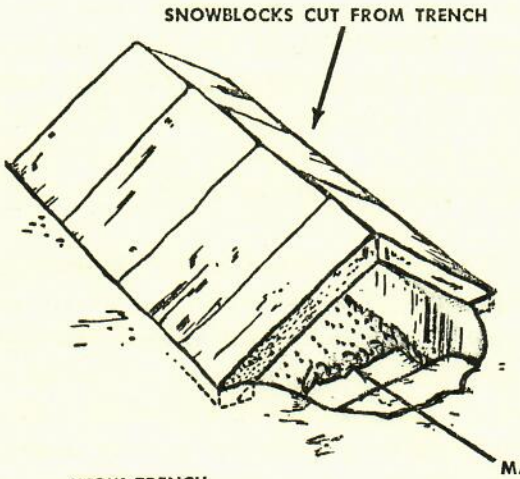
Whenever possible, the Ranger should avoid wearing damp clothing. Stockings should be watched with special care, since the extremities are most susceptible to frostbite and hence should be protected as much as possible. A good way to dry socks overnight is to take them into the sleeping bag with you. This requires a considerable amount of courage, since the prospect of sleeping with a clammy bundle is not exactly relished by most. But the end product, a pair of dry socks, will be appreciated the next morning. An alternative means of drying damp socks (aside from the obvious method of warming them over a fire) is to insert them between the sleeping bag and the groundcloth, on top of the bedding material.

Shelter and Bedding. In Winter, perhaps more than any other time of year, the conservation of body heat becomes extremely important around camp and in the field. An equally important - and related - goal is to keep as dry as possible. When erecting a shelter under snow conditions, it is usually best to clear snow down to the bare earth before erecting the shelter. Even when building on the bare earth, however, it is essential to provide adequate bedding to insulate against the cold ground. Various forms of bedding, including the idea of pre-heating and drying the ground, have been discussed in the subsection entitled Bedding, above. The point of separation from the cold ground is especially important; hence, natural beds such as the evergreen bough beds mentioned should be piled especially deep for winter sleeping conditions.

It is possible to establish bedding on top of snow, if the bedding material is piled thick enough. A problem immediately arises, however, when the Ranger wishes to heat the inside of his shelter with a reflector fire. The result may be a miserable pool of cold water - hardly a way



SNOW TRENCH



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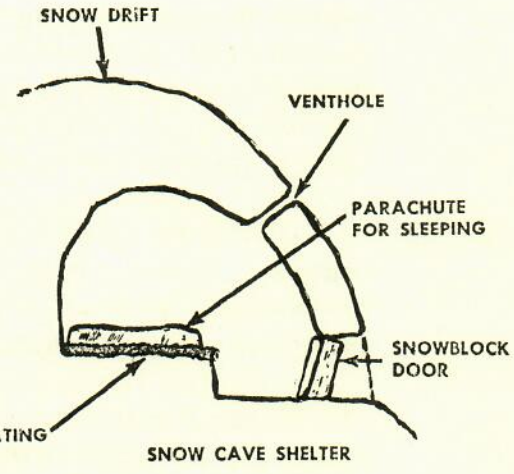
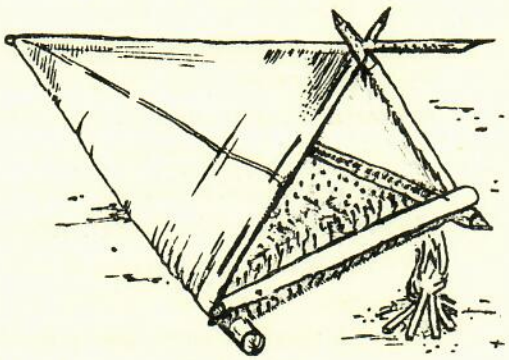


SNOW CAVE SHELTER

TREE-PIT SHELTER



ONE-MAN SHELTER

Figure 2.1-9. Arctic Shelters

to satisfy the requirement of keeping dry. Incidentally, reflector fires are a particularly welcome commodity under arctic conditions. The added warmth not only helps one to get adequate rest throughout the night; it also ensures a relatively warm reveille the next morning. It should go without saying that all precautions concerning the use of fire must be observed, including the posting of a fire watch to avert potential disaster.

Strange as it may sound to the uninitiated, snow itself is a good insulator. So long as it is not likely to melt and "flood out" the individual, snow can be put to good use - for example, in building wind-breaking walls around the lean-to. Many ingenious methods of using snow in constructing shelters, along with other helpful precautions relating to winter camping conditions, are presented in the following abstract from AFM 64-5.

"In the Winter. You will need shelter against the cold.

"Camp in timber if possible, to be near fuel. If you can't find timber, choose a spot protected from wind and drifting snow. Don't camp at the bases of slopes or cliffs where snow may drift heavily or come down in avalanches.

"Keep the front openings of all shelters crosswind. A windbreak of snow or ice blocks set close to the shelter is helpful.

"In making shelters, remember that snow is a good insulator.

"In timberless country, make a simple snow cave or burrow by digging into the side of a snowdrift and lining the hole with grass, brush, or tarpaulin. Snow caves must be ventilated. If the snow isn't deep enough to support a roof, dig a trench in a drift and roof it with snow blocks, tarpaulin, or other materials.

"In wooded country make a tree-pit shelter if snow is deep enough. Enlarge the natural pit around a tree trunk and roof it with any available covering.

"Prevent carbon monoxide poisoning by providing good ventilation in closed shelters in which a fire is burning.

"Don't sleep directly on the snow. Provide insulation under your sleeping bag or body. Lay a thick bough bed in shingle-fashion, or use sea cushions, tarpaulins, or even an inverted and inflated rubber life raft if available.

"Keep your sleeping bag clean, dry, and fluffed up to give maximum warmth. To dry the bag, turn it inside out, beat out frost, and warm

it before the fire - but don't burn it. Wear only dry clothes to bed. Keep them loose. (With an adequate sleeping bag, it is usually a good idea to strip down to one layer of clothing. A dry pair of socks worn in the sleeping bag will help keep the feet warmer - but never wear boots in the bag!) Turn over with rather than in the sleeping bag."

Although the typical Ranger team will not be carrying inflatable rubber life rafts as part of their inventory, the rest of the information conveyed is worth keeping in mind.

A final comment is in order concerning the location of one's campsite. In areas of heavy snowfall and sudden blizzards, it is desirable to avoid the leeward side of hills or ridges. It is on these very sides that large accumulations of drifting snow may occur, either possibly resulting in avalanche conditions, or endangering the camper by covering him with drifting snow overnight. For the same reason, the opening to a snow shelter or most other shelters under heavy snow conditions should be located perpendicular to the prevailing wind, so that drifting snow would not block the opening and prevent escape.

Garbage Disposal and Field Sanitation. Most missions involve camping in one location for at least a day or more; consequently, the need for some system of waste removal is obvious. If nature calls while the team is on the move, a simple cat-hole dug with the heel of the boot, a stick, or a folding shovel would suffice. But around the campsite, such a practice would soon become unpleasant and, more important, unsanitary. Hence, the need arises for a strategically located latrine.

Proper methods of garbage disposal, latrine construction, and latrine location are discussed in BSH, indexed under "garbage disposal," "waste disposal," and "latrine." NOTE: for purposes of Ranger Team activity, IGNORE THE DIMENSIONS FOR STRADDLE-TRENCHES SUGGESTED BY BSH AND CAMPING. Instead, the following will be considered standard for a 12-man team staying in a fixed area for more than one day:

Straddle-trench:

> 1 foot wide by 2 feet deep by 3 feet long. Individuals must cover refuse immediately after each use. Latrine must be closed when refuse is within one foot of surface or when latrine is abandoned. Each team should construct a separate straddle-trench for its exclusive use.

Location:

> NO latrine shall be constructed within 100 yards of the kitchen or cooking area, nor within 30 yards of personnel tents. For other considerations concerning location of the latrine, consult the above references.

A lengthy discussion of the rationale behind these precautions and their implications for personal health is included under the Health and Safety section of this manual (in a subsection entitled "Health and Sanitation").

Fire Building. Fires provide a number of useful services to the camper: they give warmth and light at night, provide heat for cooking, and even serve as a signal in case of emergency. Correspondingly, different types of fires and firewood are appropriate in different situations. A signal fire, for example, would be prepared from fast-burning softwood, with a supply of evergreen and other green wood or leaves on hand to create much smoke, in case an aircraft approaches. On the other hand, a reflector fire for warmth might be built with hardwood, due to its slow-burning qualities. Building a fire in wet weather poses additional challenges to the Ranger. In view of the above, the Ranger should be familiar with different types of tinder, kindling, and fuel; in addition, he must be able to properly prepare the firesite, construct various types of fires (teepee, hunter, trench) and know when each is appropriate, be able to cope with adverse weather in fire-building, and know how to properly extinguish the fire when it is no longer needed. Before making any attempts at firebuilding, however, BE SURE TO READ CAREFULLY THE SECTION ENTITLED "FIRE" under Health and Safety. Indeed, one cannot overstate the importance of the SAFETY aspects of firebuilding.

Essential information is provided under the "Fire Building and Cooking" chapter in Camping, and in BSH indexed under such topics as "fire," "fire lays," "fire places," and "firewood." In addition, the following passages are reproduced from AFM 64-3 to supplement these references:

"FIRE AND FIRE-MAKING

"The importance of fire in survival cannot be overemphasized. Fire can supplement your limited food supply by providing an external source of heat (calories).

"Fire cannot, however, be used in a careless manner. In hostile areas, a fire or the smoke from a fire will telegraph your presence faster than any other survival practice. A fire can be seen for many

miles at night, and a fire inside a parachute shelter becomes a veritable beacon. In hostile areas, you should insure that your fire is built so that an unwanted observer will not notice it until he is right on top of it. If you move in very close to it, a small fire will provide as much usable heat as a large fire.

"You will need fire for warmth, for keeping dry, for signaling, for cooking, or for purifying water by boiling. Follow the tried and proved advice below.

"Don't build your fire too big. Small fires require less fuel and are easier to control, and their heat can be concentrated. In cold weather small fires arranged in a circle around an individual are much more effective than one large fire.

"Preparing Fireplace

"Prepare the location of your fire carefully. Clear away leaves, twigs, moss, and dry grass, so that you don't start a grass or forest fire. If the ground is dry, scrape down to bare dirt. If the fire must be built on snow or ice or wet ground, build a platform of logs or flat stones.

"To get the most warmth and to protect fire from wind, build it against a rock or wall of logs which will serve as a reflector to direct the heat into your shelter. Cooking fires should be walled in by logs or stones but only to provide a platform for your cooking pot. Beware of wet or porous rocks - they may explode when heated.

"Tinder, Kindling, and Fuel

"Combustible materials normally fall into three categories. In the order in which they are used, they are: (1) tinder, (2) kindling, and (3) fuel.

"Tinder is that type of material which will ignite with a minimum of heat - even a spark. In this category may be found:

Birch bark
Shredded inner bark from cedar trees
Fine, dry wood shavings
Dry straw
Sawdust
Waxed paper
Bird down (fine feathers)
Seed down (milk weed, cattails)
Charred cloth

"Kindling is usually considered to be readily combustible fuel that is added to tinder as soon as sufficient flame to ignite it has become available. Kindling is used to bring the burning temperature up to the point where larger and perhaps less combustible fuel can be added. In the kindling category are found:

Small twigs
Split wood
Heavy cardboard
Pieces of wood removed from the inside of larger pieces
Wood that has been soaked in or doused with highly flammable materials; i.e., gasoline, oil, wax, etc.

"Tinder and kindling must be kept dry. Other larger fuels can be used even though they are not completely dry as long as sufficient kindling is used to bring the burning temperature up to the point where they will ignite. Gasoline or other highly flammable material should not be poured on a fire that has already started. Even a smoldering fire can explode and cause serious burns.

"For fuel, use dry standing dead wood and dry dead branches. Dead wood is easy to split and break - pound it on a rock. The inside of fallen tree trunks and large branches may be dry even if the outside is wet; use the heart of the wood. Almost anywhere you can find green wood that can be made to burn, especially if finely split. In treeless areas, you can find other natural fuels, such as dry grass which you can twist into bunches, peat dry enough to burn (found at the top of undercut banks), dried animal dung, animal fats, and sometimes even coal, oil shale, or oil sand lying on the surface. If you have no natural fuels but if you are with the aircraft, you can burn gasoline and lubricating oil or a mixture of both.

"Fire-Making with Matches and Lighter

"Prepare fireplace, getting all your materials together before you try to start the fire. Make sure your matches, kindling, and fuel are dry. Have enough fuel on hand to keep fire going. Arrange small amount of kindling in low pyramid, close enough together so flames can lick from one piece to another. Leave a small opening for lighting and air circulation.

"Save matches by using a "shave stick," or make a fagot of thin, dry twigs, tied loosely. Shield match from wind, and light fagot or shave stick. Apply this to lower windward side of kindling, shielding it from wind as you do so. If you have a candle, save it for future emergency use.

"Small pieces of wood or other fuel can be laid gently on kindling before lighting or can be added after kindling begins to burn. Lay on smaller pieces first, adding larger pieces of fuel as fire takes hold. (Don't smother fire by crushing down kindling with heavy wood). Don't make the fire too big. Don't waste fuel.

"Useful Hints

"Don't waste your matches by trying to light a poorly prepared fire. Don't use matches for lighting cigarettes; get a light from your fire or use a burning lens. Don't build unnecessary fires; save your fuel. Practice primitive methods of making fires before all of your matches are gone.

"Carry some dry tinder with you in a waterproof container. Expose it to the sun on dry days. Adding a little powdered charcoal will improve it. Collect good tinder wherever you find it. Cotton cloth is good tinder, especially if scorched or charred. Works well with burning glass or flint and steel.

"Collect kindling along trail before you camp. Keep firewood dry under shelter. Dry damp wood near fire so you can use it later. Save some of your best kindling and fuel for quick fire-making in the morning.

"To split logs, whittle hardwood wedges and drive them into cracks in the log with a rock or club; split wood burns more easily. Never swing an ax toward your foot or other parts of your body.

"To make a fire last overnight, place large logs over it so that the fire will burn into the heart of the logs. When a good bed of coals has been formed, cover it lightly, first with ashes and then dry earth. In the morning the fire will still be smouldering.

"Fire can be carried from one place to another in the form of a lighted punk, smouldering coconut husk, or slow-burning coals. When you want a new fire, add tinder or small fuel and fan or blow the smouldering material into flame.

"Don't waste fire-making materials. Use only what is necessary to start a fire and to keep it going for the purpose intended. Put out the fire when you leave the camp site with water and mineral soil. Mix it well until you can insert your hand."

Knots. The five knots most useful in camping and general outdoor activities include: 1) the square knot; 2) the bowline; 3) the sheet bend; 4) the tautline hitch; and 5) the half-hitch (or its cousin, the two-half-hitches). Each knot has a specific purpose, and each does a particular

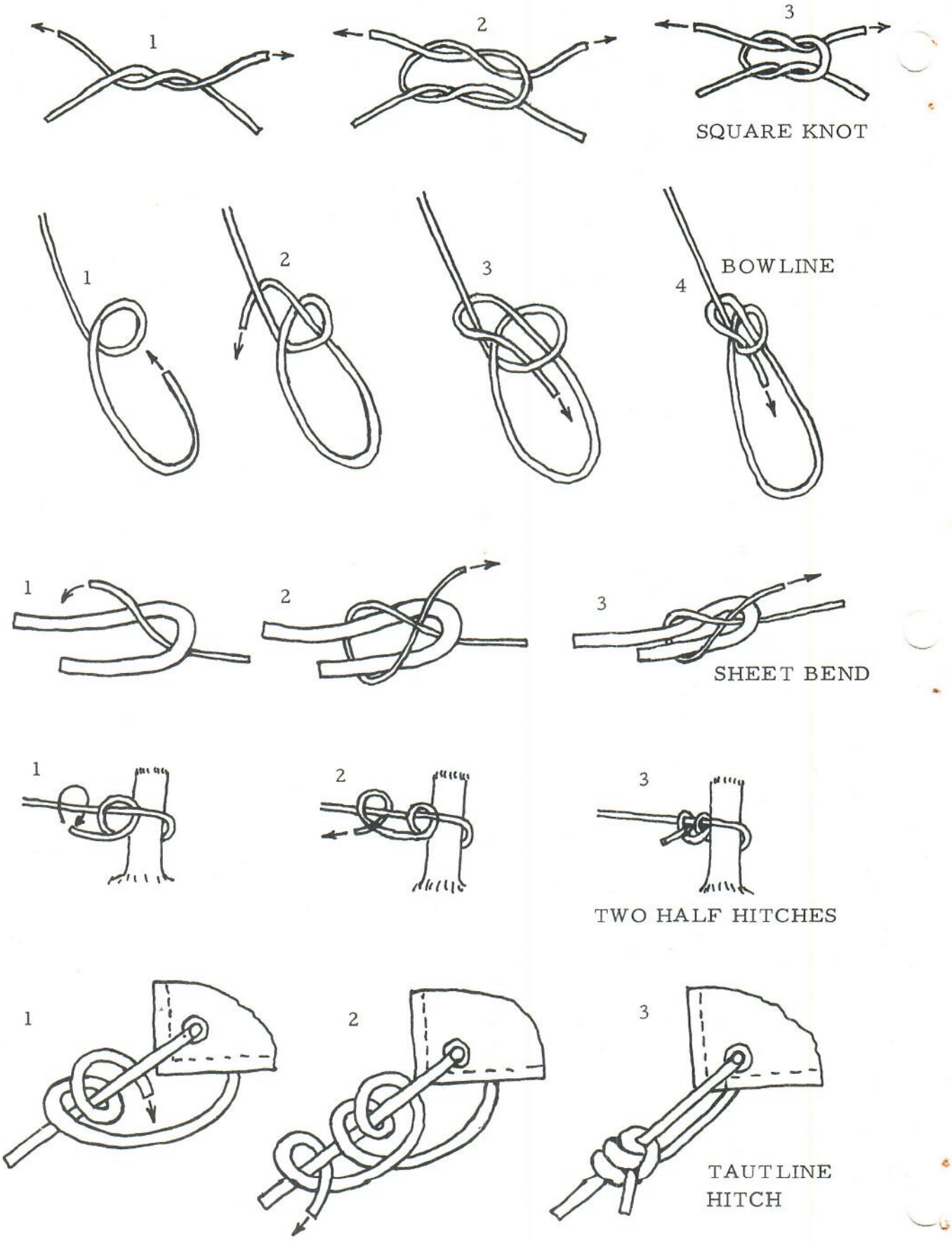


Figure 2.1-10. Basic Knots for Ranger Work

job "best." The bowline, for example, forms a non-slipping loop which can be used to move a person up or down the side of a sheer cliff. Variations in the bowline will be discussed in the Mobility section. A sheet bend can be used to connect two ropes, even if the ropes are of different thickness. The tautline hitch makes tentline adjustments easy, since this hitch slips when loose, but remains fast under tension. The two-half-hitches constitute a simple but firm way to temporarily attach a rope to a tree or other object. Finally, the square knot is used primarily for binding, such as in tying off a triangular bandage. Illustrations of these knots are provided in Figure 2.1-10. For the "whipping" technique for preventing the fraying of rope ends see BSH.

It is important that each Ranger master these basic knots, and know when each is appropriate for a particular task. In addition, he should be able to demonstrate knowledge of proper care of ropes (discussed in the Mobility section), and a mastery of techniques for keeping the line from fraying. "Whipping techniques" which prevent lines fraying are discussed in BSH under "Knots."

Food Preparation. Having an adequate meal is essential to top performance in any sustained endeavor, and the Team Commander who fails to provide time for meals is being very foolish, and possibly short-sighted, if there is the possibility that the search mission may be prolonged. However, an "adequate" meal can consist of foods which are pre-cooked and ready to eat - right out of the can, if necessary (with or without heating). REDCAPs demand a very efficient use of time, and this often means trimming down the time normally used for food preparation. Under such circumstances, canned and other pre-cooked foods are quite appropriate. (See the discussion of emergency food packages under the Mission Preparedness section above, for further details).

Since the average Ranger spends many days in the woods each year, either in training or on missions, it would be to his advantage to explore some of the finer aspects of camp cooking. Indeed, one of the highlites of any camping trip should be a well-cooked meal of FRESH foods - meat, vegetables, and fruit. But there are more important reasons than personal pleasure for including detailed training in food preparation. For example, one learns little of survival cooking by throwing a can of Spam onto the fire; yet, by using fresh vegetables and meats, the Ranger must become familiar with the various aspects of cleaning, preparing, and preserving these foods. As a by-product (assuming a reasonable degree of success), a well-fed Ranger becomes a satisfied Ranger, - better able to perform his assigned tasks on the mission.

The following discussion and references are certainly not intended to make the reader a full-fledged chef; however, it is hoped that

enough skills will be mastered to make camp cooking a pleasurable experience rather than a chore. In fact, a few teams have experimented with group cooking. This practice requires planning and cooperation (do you have a TEAM, or just a bunch of individuals?), but on base or in camp it is perhaps the most efficient manner of feeding a large group. In this case, two or three members take complete charge of gathering firewood and the preparation of food, while the rest are freed for other activities - classwork or campsite improvement on a training mission, security on a REDCAP, etc.

A really proficient Ranger should show the ability to prepare each of the following types of foods: raw meat and fish; baked potatoes and corn; other types of raw (not canned or frozen) vegetables; dehydrated foods; eggs (boiled and fried); and hot cereal and beverages. He should note that different foods take different lengths of time to prepare; for example, if baked potatoes and steak are planned for a certain meal, the potatoes will take at least 40 minutes in the coals, while a properly broiled steak (depending on size) will take from 5 to 10 minutes. Further, the potatoes would require a bed of hot coals for baking, while the steak should be quickly seared over an open flame to seal in the juices, then finished over glowing coals.

Frying, broiling, and baking (especially in a reflector oven) each require different types of fire and amounts of heat. For example, lively flames are needed to bake in a reflector oven, but flameless hot coals are best for frying. Frying fatty materials over a blazing fire will probably result in the grease itself becoming ignited. Charcoal has its place, but that place is not on the dinner plate!

One of the better sources of information concerning camp cooking is the Cooking pamphlet of the Boy Scout Merit Badge Series. It is not necessary to read this booklet entirely; selective reading of relevant sections would be sufficient. In addition, BSH has several sections on cooking that are worth scanning.

Respect for Property. Any discussion on woodsmanship always includes a few words on common courtesy... and the present discussion is no exception. Probably the most important consideration in this respect is - RESPECT THE PROPERTY OF OTHERS! Obtain permission from the owner of private land if your training mission will involve camping on or crossing his property. Respect his crops and shrubbery, and don't cut live wood unless absolutely necessary (and then, only with his permission!). Be extremely careful with fire, and when breaking camp, be sure to clean the area thoroughly. Try to leave the site in BETTER condition than it was when you arrived.

The above comments apply generally to ALL field operations, including REDCAPs. Although you may not need specific permission of

the owner to establish security over a crash, it is a good idea to let the landowner know WHY you are there, WHAT your intentions and needs are, and HOW LONG you expect to be on duty. And remind him that, by securing his property, you are actually protecting it from damage by the many curiosity-seekers who inevitably appear. These simple courtesies sometimes pay off in unexpected ways; for example, once the property owner knows why you are there, he will often volunteer important services - his telephone, use of farm equipment, shelter, and the like. On several of the many REDCAPs in which this author was involved, local owners or groups of neighbors actually banded together and volunteered to provide meals for the entire team! Gestures such as this are really welcome; one gets the feeling that he is not alone in his desire to help others. Courtesy sometimes goes a long way.

2.1.4 HEALTH AND SAFETY

One of the primary goals of first aid training is the PREVENTION of accidents; likewise, this section takes prevention as its guiding theme. Accidents and illness cause unnecessary delay, and a delay of even several hours under certain conditions might prove fatal to the would-be survivor. For example, an injured pilot who survives an air crash in mid-Winter is particularly vulnerable to death by exposure, as is a person lost under similar conditions.

The mastery of the art of handling and caring for cutting tools and fire, the learning of proper hiking principles, and the knowledge of principles of health and personal hygiene will pay off in the long run by preventing sickness and accidents - and, by implication, unnecessary delay and discomfort. Thus, the Ranger should be constantly on the alert, especially when in the field; he should try to anticipate potentially dangerous situations and know how to cope with them effectively. With this orientation, four areas of possible hazard are discussed below.

Hiking. Even a routine training mission exposes the Ranger to many hazards on the trail. In the excitement of a REDCAP, however, the danger is increased considerably, since the average member might become very absorbed with concern over the mission itself and tend to forget normal precautions. Of course, the mission should be of concern to the Ranger; but keep in mind that a sprained ankle or broken leg not only makes the individual incapable of being any help, it also ties up other Rangers - possibly an entire team! - who must help the injured person back to base. Thus, throwing caution to the wind in the interest of the mission is not only foolhardy; it will more than likely hinder the progress of the mission itself.

Effectiveness in hiking begins with proper footcare. With this in mind, the following discussion from U. S. Army Field Manual 21-75 emphasizes several important aspects of foot care.

"Care of the feet is important to every soldier. Start every day with a clean pair of socks. Feet swell some during the day, particularly during a march, so do not crowd on extra socks. Wear enough to be comfortable and to cushion the feet but not enough to cause tightness which cuts off circulation. (The recommended variety of socks for field wear is the Army cushion-sole type. These are not only a very durable product, but also quite comfortable and absorbant, not to mention their superior insulating properties.) Avoid wearing torn or poorly mended socks - they cause blisters. When changing socks, wipe each foot thoroughly with the top of the old sock, rubbing well between your toes; use foot powder and put on the fresh socks, smoothing out all wrinkles. When wearing more than one pair of socks, change the pair next to your skin. Always carry extra socks in the top of your pack where they can be slipped out without disturbing the entire pack.

"Do not use ointments, salves, or medicines on your feet unless prescribed by a medical officer. Many commercially sold medicines tend to soften the skin or to increase sweating. Prevent corns and calluses by wearing properly fitted shoes; if you get a corn or callus, seek medical attention.

"Athlete's foot is a condition of the feet caused by a fungus. This fungus grows best in warm and moist places such as your feet. You can prevent it from spreading by keeping your feet clean and using foot powder to help keep them dry."

Care for blisters and frostbite are discussed in the Medical section of this manual. Other foot problems, along with precautions designed to <u>prevent</u> frostbite, are also mentioned in FM 21-75:

"Trench Foot or Immersion Foot

"In cold or wet weather, improper care of your feet may result in a condition known as trench foot or immersion foot. When the condition is mild, the feet are pale and look shriveled; later, they lose all feeling. Still later, they swell and become very painful. This is the dangerous stage. Gangrene may result and require amputation of the toes or even the entire foot.

"To guard against trench foot and immersion foot, follow the simple rules listed below:

a) Exercise your feet.
b) Keep your feet as clean as possible.
c) Keep your feet as dry as possible.
d) Put on clean, dry socks as often as possible.
e) Do not wear tight footgear or tight socks.

f) Remove your footgear and massage your feet.

"It is especially important to exercise your feet in order to maintain circulation. When standing in mud for long periods, wiggle your toes inside your shoes, rise on your toes, and bend and twist your ankles. Remove your shoes at least once a day and massage your feet carefully and gently to stimulate circulation. Use plenty of foot powder and put on dry socks. You can dry wet socks by carrying them underneath your shirt next to your underwear.

"Do not slow circulation by cramming on extra socks or by wearing tight shoes. If your shoes feel tight, loosen the laces. Wear loose clothing around the knees and calves of your legs.

"When you come into a heated shelter after a long period of standing in the cold or wet, keep your feet away from the source of heat until the circulation starts coming back. Too much heat applied too suddenly is dangerous because it causes a sudden enlarging of blood vessels and a rush of blood to tissues not ready to receive it.

"Frostbite.

"Frostbite or local freezing can be avoided by wearing warm and loose clothing and keeping dry. Proper footgear and mittens are especially important. If any part of your clothing becomes wet, dry or change it at once. You can get overheated and perspire in cold climates and this perspiration may later freeze inside your clothes. Avoid this by wearing lighter clothing when you are exerting yourself, or by opening your clothing to allow air to circulate and moisture to escape. Do not touch cold metal with your bare hands or lips. Skin immediately freezes to such surfaces. If the skin should adhere to a metal surface, release it by warming the metal. The skin will be damaged if forceably separated from the metal."

Hiking or marching along roads presents special safety problems. Day or night, the safest place to walk along a road is on the shoulder or the extreme edge of the road, facing oncoming traffic. In this manner, traffic can be observed quickly and hikers will be able to get off the road in time to avoid an accident. Of course, a column of files is the most appropriate formation for marching along roadways. Nighttime presents the further problem of visibility. To compensate, the lead and tail member of the column should be equipped with red safety lights and light-reflecting vests. Ideally, it is desirable that each man wear some light-reflecting object (such as a piece of white cloth attached to the sleeve or leg). A clean, white pistol belt (provided, of course, that it is not covered by a coat or raincoat) serves the same purpose to a degree.

Hunting season presents additional safety problems for the Ranger. During this time of year, each team member should wear an international orange hunting vest. This item can be purchased at a reasonable price from any sporting goods store, or a fine substitute can be constructed from the orange panels of a parachute. Since these vests are particularly useful on flightline duty, navigation work, and numerous other C. A. P. activities, it would be a good squadron project to mass-produce these items for the team's store of equipment.

During hunting season, one should NEVER expose patches of white on the uniform, when in the field (as has been suggested for night travelling). Such patches might be mistaken by a distant hunter as the white tail of a fleeing deer. Unfortunately, there are enough hunters who, when confronted with such a situation, would actually shoot first before confirming that the patch of white actually belongs to a deer! Don't put yourself in this vulnerable position!

With this introduction to foot care, footwear, and marching along roadways, the reader is directed to examine the discussions concerning Mountain Walking, General Precautions in Mountain Walking, and Balance Climbing in the Mobility section of this manual, before proceeding.

Cutting Tools. Improper use of knives and axes can cause serious injury or death to the user or possibly to a bystander. On the other hand, a well-cared for knife might help save your life someday, if you are placed under conditions of survival. Keep it dry, clean, and sharp. Wipe the blade clean after using it to prevent rusting. Keep it out of the fire - a surprisingly short period over a flame will remove the temper, whereupon your knife is nearly worthless. The joints and springs of your pocket knife should be oiled occasionally. The axe requires similar care. In addition, the axe should either be driven into a chopping block when not in use, or (preferably) the head should be covered with a leather sheath, and the axe stored in a dry place. Avoid driving the head into the ground when chopping.

The necessity of having sharp cutting tools is difficult to overstate. A dull axe, for example, not only makes the job more difficult; it will have a greater tendency to deflect and cut an unintended object - such as a leg. Dull machetes are especially dangerous weapons, for much the same reason.

An excellent illustrated discussion on care and use of cutting tools is offered in BSH, indexed under "ax," "knife," and their various subdivisions (such as care, carrying and passing, preparing firewood, safety, sharpening, and the like). For machete sharpening techniques, refer to the Mobility section of this manual. Finally, the passage reprinted below from AFM 64-3 addresses the same topic.

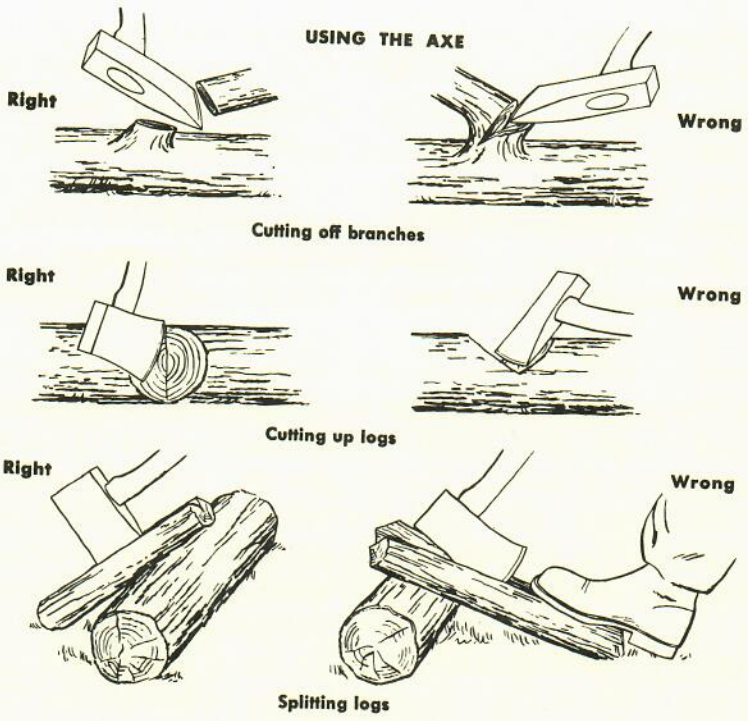


Figure 2.1-11. Use of the Axe.

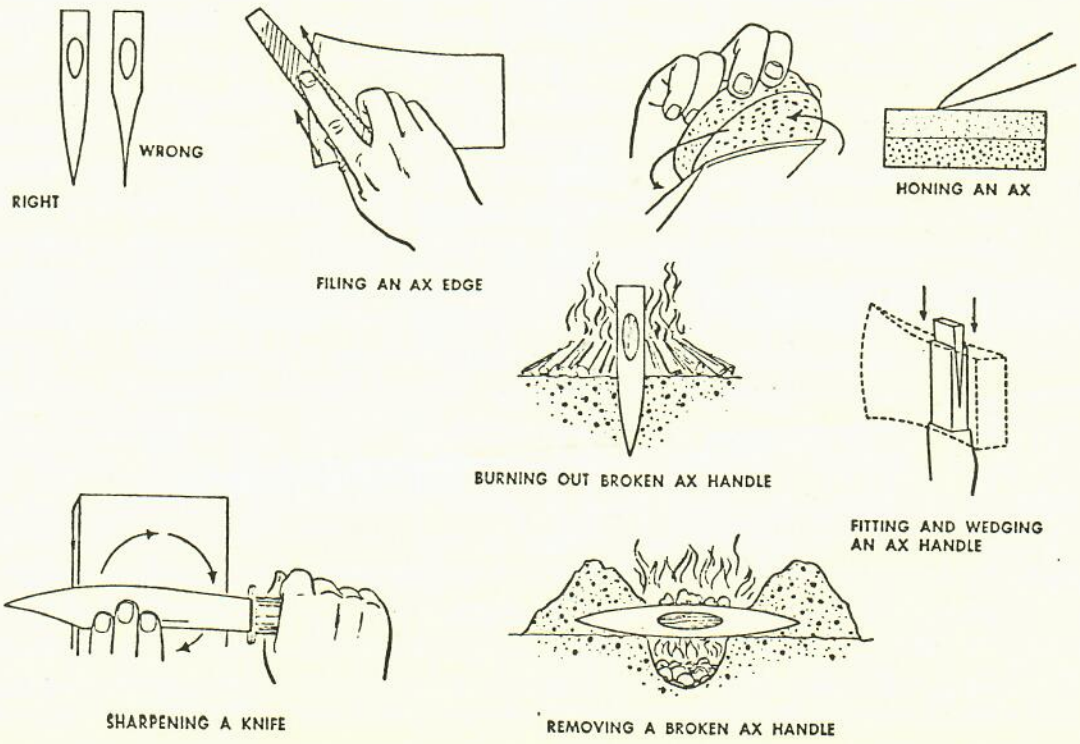


Figure 2.1-12. Repairing an Axe and Sharpening Techniques

"AXES AND KNIVES

"Your cutting tools are important aids to survival in any environment. For best results, use them and care for them properly.

"When you use an ax, don't try to cut through a tree with one blow. Rhythm and aim are more important than force. Too much power behind a swing interferes with your aim. When the ax is swung properly, its weight will provide all the power you need."

Before taking that first swing, check the treetop for dead branches which might come crashing down, causing injury or death to the chopper.

"Before doing any chopping, clear away all obstructions. A branch, vine or bush can deflect an ax onto your foot or leg. Remember, an ax can be a wicked weapon. The illustrations (Figure 2.1-12) show how to use it safely.

"A broken handle is difficult to remove from the head of the axe. Usually the most convenient way is to burn it out. For a single-bit ax, bury the blade in the ground up to the handle, and build a fire over it. For a double-bit, dig a little trench, lay the middle of the ax over it, cover both bits with earth, and build the fire. The covering of earth keeps the flame from the cutting edge of the ax and will save its temper. A little water added to the earth will further insure this protection.

"If you have to improvise a new handle, save time and trouble by making a straight handle instead of a curved one like the original. Use a young, straight hardwood without knots. Whittle it roughly into shape and finish it by shaving. Split the end of the handle that fits into the ax head. After it is fitted, pound a thin, dry wooden wedge into the split. Use the ax awhile, pound the wedge in again, then trim it off flush with the ax. Scrape the handle smooth to remove splinters. The new handle can also be seasoned to prevent shrinkage by "scorching" it in the fire.

"Your survival kit may include a file or a whetstone. If you haven't a sharpening tool, look for a natural whetstone. You will need it to sharpen your knives and axes.

"Any sandstone will sharpen tools, but a gray, somewhat clayey sandstone gives better results. Avoid using quartz. You can recognize quartz instantly by scratching your knife blade with it - quartz is the only common mineral that will bite into steel.

"If you don't find sandstone, look for granite or any glittering, crystalline rock except marble. If you use granite, rub two pieces of

the stone together until they are smooth before you use one as a grindstone.

"Axes can be sharpened best by using both file and whetstone, but a stone alone will keep the ax usable. Use the file every few days, the whetstone after each using. Always push the file away from the blade. (See Figure 2.1-13 for sharpening techniques and repairing an axe).

"Put a finer edge on your ax with the whetstone. Wet the stone and move it in a circular motion from the middle of the blade to the edge.

"A snow knife can be sharpened with file alone. Other knives are sharpened with the whetstone alone. Hold the blade at a slight angle to the stone. Push the blade away from you. Sharpen the blade alternately. You can get a keener edge by gradually decreasing the pressure on the blade.

"Sharpen a machete as you would a knife." (See Section 2.7.3 of Mobility)

"A knife should be sharpened only with a stone. Repeated use of a file will rapidly remove steel from the blade. In some cases, it may be necessary to use a file to remove plating from the blade prior to using the stone. A circular motion of the blade on the stone used on alternate sides will put a good cutting edge on the knife."

Fire. The reader is encouraged to reexamine the section and references on "Fire Building" above, with special emphasis on those statements directed toward safety measures. However, a few points need to be accentuated. First, the ground MUST be cleared completely; all debris should be removed down to the BARE EARTH. This precaution prevents the possibility of a fire spreading under the surface layer, and it also minimizes the danger from flying embers. In addition, care should be taken NOT to build a fire close to overhanging trees or too close to dry brush. Also, proper selection of firewood will reduce the production of sparks to a minimum. Second, some means of extinguishing the fire should be provided BEFORE the fire is built. This could consist of a pile of dirt or sand nearby, or the availability of water. If the fire is built in camp or on a base, a fire bucket nearby is recommended. Third, certain types of porous or wet rocks may explode when heated; hence, choose rocks carefully in constructing the fireplace. Fourth, the fire should be built only large enough to satisfy the particular need at hand. A roaring bonfire is seldom necessary (except maybe for signal purpose) and it constitutes a serious hazard, as well. For warmth and cooking, a few small fires strategically placed will afford more effective heating and more safety than one big fire. Fifth, any person working around the fire should exercise caution and common sense to prevent his clothes or his equipment from being ignited. Wear a special glove for removing

pots and pans from the fire. Sixth, a fire-watch should be appointed to ensure that safety practices are enforced and that no fire is left untended. Needless to say, all fires must be THOROUGHLY extinguished before the team moves out.

Finally, don't build a fire too close to the material of your shelter. Special precautions are in order under windy conditions. For example, the fire should be reasonably well sheltered from gusts of wind to guarantee even burning of fuel and to avoid the possibility of showering the camp area with glowing sparks. If a reflector fire has been built near the entrance of a lean-to for warmth, the entrance should be located on the leeward side. In this case, any wind will carry smoke away from the tent area, instead of into it. Further, the tent or lean-to provides an additional windbreak for the fire, which in turn reduces fuel consumption.

Fires positioned too close to the shelter, or located improperly with respect to prevailing wind conditions, constitute a serious safety hazard. Failure to observe these simple precautions has caused several near-disasters in cases familiar to this author. A sudden gust of wind can easily fan the flames into the shelter material, resulting in a blazing - and possibly fatal - inferno. When positioning the fire, the camper should ask himself the additional question: "Have I provided myself a safety exit, in case something goes wrong?"

Fire can be a Ranger's strongest ally OR his deadliest enemy: extreme caution in its use is mandatory.

Health and Sanitation. It is quite sobering to note that the greatest source of casualties during all wars prior to World War II was disease! Neglect in matters of personal hygiene and sanitation can very easily result in a severely disabled Ranger Team, as well. Thus, the importance of this discussion cannot be overestimated. To begin, we refer to several points worthy of consideration from AFM 64-3.

"HEALTH AND SANITATION

"Keeping well is especially important when you are stranded on your own. Your physical condition will have a lot to do with your coming out safely. Protection against heat and cold and knowledge of how to find water and food are important to your health. But there are more rules you should follow.

"Save your strength. Avoid fatigue. Get enough sleep. Even if you can't sleep at first, lie down, relax, loosen up. Stop worrying; learn to take it easy. If you are doing hard work or walking, rest for ten minutes each hour. It is usually wise to stop traveling early enough

in the day to make a comfortable camp. The rest you get will pay off.

"Take Care of Your Feet

"Take care of your feet if you anticipate doing a lot of walking. Prepare in advance. Be sure your feet and footgear are in good condition. Break in your shoes (and yourself) slowly.

"Feet should be kept clean. Toenails should be cut straight across. Bathe and massage the feet daily.

"Remove clots of wool from socks. Keep your socks clean and change them frequently, if possible.

"Inspect the inside of your shoes and the inside and outside of socks for possible sources of friction. Improvised insoles may reduce friction inside shoes.

"Air shoes at night by putting them on small stakes. This keeps inside of shoes dry and eliminates danger of scorpions, centipedes, and other crawling vermin.

"Examine your feet when you first stop, to see if there are any red spots or blisters. Apply adhesive smoothly on your skin where shoes rub. If you have a blister, pierce through the thick skin at its base with a flame-sterilized needle and press out the fluid. Don't remove the protective skin over the blister. Sterilize the area around the blister before puncturing. (Otherwise, the sterile needle will carry germs from the surrounding area into the blister.) Apply sterile dressing after drainage.

"Guard against skin infection. Your skin is the first line of defense against infection. Use an antiseptic on even the smallest scratch, cut, or insect bite. Keep your fingernails cut short to prevent infection from scratching. Cuts and scratches are apt to get seriously infected, especially in the tropics. A bad infection may hurt your chance of coming out safely.

"Guard Against Intestinal Sickness

"Diarrhea and other intestinal sicknesses may be caused by change of water and food, contaminated water or spoiled food, excess fatigue, overeating in hot weather, or using dirty dishes. Purify all water used for drinking, either by using chemicals or by boiling for one minute plus one additional minute for each 1,000 feet of elevation above sea level. Cook the plants you eat, or wash them carefully with purified water. Make a habit of personal cleanliness; wash your hands with soap and

water, if possible, before eating. If one member of your group gets diarrhea, take special care to enforce measures for proper disposal of human waste and to insure cleanliness in handling food and water. Make sure feces are buried. Don't let affected members handle food and cooking utensils. Field treatment of diarrhea is necessarily limited. Rest and fast - except for drinking water - for 24 hours; then take only liquid foods such as soup and tea, and avoid sugars and starches. Keep up a large intake of water, with salt tablets. Eat several (small) meals instead of one or two large ones. Overeating of fruit, especially green fruit, may cause a temporary diarrhea. Eliminating fruit from the diet, temporarily, will relieve this condition.

"Don't worry about lack of bowel movement; this will take care of itself in a few days, provided you have an adequate daily supply of water.

"Keep Your Body and Clothing Clean

"You will feel better and keep free from skin infections and body parasites. Examine each other for external parasites.

"Keep Your Camp Clean

"Dump garbage in a pit or in a spot away from camp where it will not blow about. Dig a latrine or designate a latrine area away from the camp and water supply.

"Burn all garbage, cans, papers, cartons, etc., before covering your garbage pit. If this is not done, animals will uncover the pit and spread the refuse about the grounds.

"WATER

"Water will be one of your first and most important needs. Start looking for it immediately. You may get along for weeks without food, but you can't live long without water, especially in hot areas where you lose large quantities of water through sweating.

"Even in cold areas your body needs 2 quarts of water a day to maintain efficiency. Any lower intake results in loss of efficiency. If you delay drinking, you will have to make it up later on.

"Purify all water before drinking, either 1) by boiling for one minute plus one additional minute for each 1,000 feet above sea level; or 2) by using as directed the water purification tablets in your first aid kit; or 3) by adding 8 drops of 2% solution of iodine to a quart (canteenful) of water and letting it stand for 10 minutes before drinking. Rainwater collected directly in clean containers or in plants is generally safe to

drink without purifying. Boiling is the surest and best purification method."

The following is to some degree repetitious, but - as we have stated at the outset of this section - camp cleanliness is so vital to the function of the Ranger Team that these points cannot be emphasized enough.

There are two main aspects of camp cleanliness (aside from personal hygiene) worth considering: insect control and food contamination. The latter has been discussed at some length under the "Food Preparation" subsection of this manual, where it was implied that the best policy is to completely clean and even sterilize in boiling water all eating and cooking utensils after each use. The matter of insect control can be seen from two standpoints: first, the existence of large numbers of mosquitoes, flies, and other insects around camp is a nuisance which, at an extreme, can impair attention to one's work. Second, and more important, certain insects carry germs which could cause serious illness to one or more members of the team.

If one observes the suggestions for campsite selection and layout as discussed in the section entitled "Site Selection" and the readings related to that section, insect control will have been largely effected. However, it is fruitful to review a few of those principles in the context of insect control.

First to enter one's mind is the question of garbage disposal. Garbage attracts large numbers of flies and other insects to the campsite. Even if a garbage pit is established sufficiently far from the campsite, there remains the danger of disease spread by winged insects from these garbage disposal areas. Such danger emphasizes the need for burning garbage AS IT ACCUMULATES, preferably immediately following each meal. In addition, a grease-trap, discussed in BSH, should be used to filter dishwater. The water itself will soak into the ground, and the grease and food particles collected by the matting of grass and twigs which constitutes the filter should be burned after each use. Cans and jars should be rinsed out after all dishes and cooking utensils are cleaned, and cans must be burned out, flattened, and buried in the garbage pit. The burning process not only consumes any food particles left, but also oxidizes the protective coating of the can. Containers prepared for disposal in this manner will rust and eventually disintegrate in the pit much more readily than untreated cans, leaving no evidence for future campers to unearth.

There are other reasons why cans should be disposed of in this manner. Unsmashed cans left lying in an open garbage pit collect water from rains and retain this water for considerable lengths of time, thus

providing veritable breeding grounds for insects. Further, unwashed cans or unburned garbage placed in a pit, even when covered, usually attracts some wild animals which will attempt to dig up the buried "food." This is quite evident to the experienced woodsman who comes upon an area formerly used as a campsite; cans and bottles are often found strewn around - not through utter disregard of the former occupants of that campsite, but rather by animals who routed out this improperly-disposed garbage. Thus there are values here involving both aesthetics and health, either of which should prompt the conscientious camper to practice proper garbage disposal procedure.

In many cases, the campsite is in proximity to the unit's vehicle. In such cases, it might be much less time-consuming to carry a plastic garbage pail (covered, of course) with the vehicle for this purpose. If this practice is followed, the garbage can be disposed of in a sanitary manner when the team returns home. Be sure to wash out the garbage pail after each mission, however.

The location and care of the latrine can also be considered in light of insect and disease control. The problem of location with respect to kitchen area is especially important when group cooking is employed, since flies carrying germs from the latrine area might easily find their way to unprepared foods, thus increasing the danger of the spread of disease. To avoid the problem, the camper should ensure that all food items are adequately sheltered from possible contact with insects. In addition, the latrine should be located a good distance from kitchen and personnel areas, to minimize this danger. Finally, the latrine itself should be properly cared for. Feces must be covered with a shovel-full of dirt after each use. If lime or some other disinfectant is available, this should also be used appropriately. Many human disorders and diseases appear in the excreta, and - if left improperly treated - insects may transmit these diseases to other members of the team. Water sources can also be contaminated by the improper location of the latrine.

Then there is the question of campsite location. It has been noted that insects breed in, and generally live near, stagnant or non-running water or other damp places. Swampy areas, as well as dense forests, are very likely places to encounter mosquitoes and many other aquatic insects. For this reason, among others, such areas make poor campsites, especially in warm weather. A previous section (Site Selection") refers the reader to parts of BSH which discuss other criteria to look for in locating a suitable campsite.

Finally, BSH offers detailed discussions of methods and purposes behind camp cleanliness, in sections indexed under "Camping," "Food, Care of," "Garbage Disposal," "Waste Disposal," and the like. Some points to watch for while reading these sections include: the reasons for

insect control and some ways of combatting insects; proper care of cooking and eating utensils; the importance of burning garbage, preparing grease traps, and filling latrines; and storage of the three major categories of food (perishables, semi-perishables, and non-perishables). These precautions will help provide a pleasurable and healthful camping experience.

2.1.5 WHEN LOST: AN INTRODUCTION TO SURVIVAL

The question occasionally arises: "why teach survival techniques, when a little common sense and a short walk will generally bring you out to a road?" This question indicates a very limited conception of what "survival" really means. Besides a knowledge of specialized skills, survival involves a certain frame of mind that must be established before these skills can be put to use. This frame of mind includes a DETERMINATION that the individual will overcome his obstacles and be rescued, combined with a certain "coolness" and ability to reason out the situation. When the individual first becomes aware that he is lost, he should sit down and take stock of his possessions, scan his memory for clues which might help him get back to the trail, and develop a plan of action.

Panic is the great killer. With the right frame of mind, however, REINFORCED BY a detailed knowledge of woodsmanship and special survival techniques, the individual will have the necessary confidence to combat panic. You may never NEED to construct a snare or prepare wild vegetables for survival purposes, but the knowledge that you CAN DO SO IF NECESSARY gives a comfortable feeling. To keep calm and rational when lost is to survive and be rescued. To repeat: panic kills.

For more specifics on what to do when lost, check BSH, indexed under "lost, what to do." This information is a MUST for all Rangers, especially those who have had little field experience.

One final note: did you ever wonder why some Rangers wear whistles on their uniform? For show, perhaps... and, in some cases, for giving orders by signal. But probably the most important reason for always carrying a good whistle into the field is that it can become a supplement to your own voice. Indeed, a person separated from his group will soon become hoarse by shouting for help; yet, three blasts from the whistle at intervals conveys the same message of HELP! and reaches greater distances than the human voice.

SECTION 2.2
NAVIGATION

A detailed knowledge of map-reading and the ability to move a Ranger Team expeditiously from one point to another is essential to every Ranger Team member from Commander on down. Many examples could be used to illustrate the need for accurate navigation and the ability to move the team with minimum time loss to the crash location, but for our purposes, the following will suffice.

The setting is late Fall, the weather marginal, and a "light twin" with three people aboard has been reported missing. C. A. P. has been in full swing since the initial alert, and search aircraft have been systematically crisscrossing the area of highest probability. Ranger Teams have been sent to an advance base in this area, and anxiously await word "of the find." The terrain is extremely rugged, characteristic of the mountainous regions of the U. S. A few Teams have been deployed as Interrogation Squads to help further pinpoint the search area.

At last, the sighting is made: Coordinates of the crash location are hurriedly established, for the weather is rapidly closing in, and all aircraft are ordered to return to base. One factor increases the urgency of the situation: one pilot reports that he detected signs of life near the crash-site. With the temperature rapidly dropping, and with nearly two miles of rugged terrain completely surrounding the downed aircraft, you, the Ranger Team Commander, have a life-or-death situation at hand: the accuracy of your navigation becomes paramount!

True, most missions are not as dramatic as the one depicted above; however, Rangers must be prepared for ANY situation that may arise. Hence, the following discussion attempts to cover all the essential elements of effective Ranger navigation, including the solution of a problem giving only the coordinates of the crash-site. Proficiency here might someday save a life.

2.2.1 BASIC MAP READING

Most Ranger navigation employs the use of a U.S.Geological Survey (U. S. G. S.) map of the fifteen-minute (or, where available, the seven-and-one-half-minute) series. Maps on this scale yield sufficient detail to be very effective on short-distance navigation problems. A publication entitled Topographic Maps, supplied free by the U. S. G. S., explains in detail how topographic maps are made and used, what their limitations are, and the like. This manual is a MUST for each Ranger!

To become oriented in the use and limitations of maps in general, the following passage has been reprinted from Air Force Manual 64-3, entitled Survival: Training Edition.

"Map Reading. A map is, in its primary conception, a conventionalized picture of the earth's surface as seen from above, simplified to bring

out important details and lettered for added identification. A map represents what is known about the earth rather than what can be seen by an observer. However, a map is selective, in that only information which is necessary for the map's intended use is included on any one map. Maps also commonly include features which are not visible on the earth, such as parallels, meridians, and political boundaries.

"Since it is impossible to portray accurately a round object, such as the earth, on a flat surface, all maps have some elements of distortion. Depending on the intended use, some maps sacrifice constant scale for accuracy in measurement of angles, while others sacrifice accurate measurement of angles for a constant scale. However, most maps used for ground navigation use a compromise projection in which a slight amount of distortion is introduced into the elements which a map portrays, but in which a fairly true picture is given.

"Map Symbols. By means of standard symbols, maps show important roads, side roads, trails, towns, villages, woods, streams, lakes and the features that help you recognize the terrain as you look at it or travel over it. Conventional signs and symbols are standardized. Those which require special explanation are usually contained in the legend included at the bottom of most maps. A great deal of information which is necessary for the proper interpretation of a map is usually printed on the borders of the map. Always read the marginal information before using a map. It may save you from making serious mistakes.

"Contour Lines. Contour lines are the wiggly brown lines on a map and are drawn linking all points at a given height above sea level. You will note that these lines are broken at intervals and a figure inserted in the break, such as 6500, 7000, 7500, or 8000. These figures indicate the height in feet of the contour line above mean sea level. Always check the marginal information to find the contour interval. Some of the lines carry no identifying numbers, but since the contour interval is known, the height of any unnumbered line can be determined by its relation to the numbered lines. For example: the contour interval is 100 feet and an unnumbered line is two lines away from the 9000-foot line and three lines from the 9500-foot line, the elevation at any point on the unnumbered line is obviously 9200 feet. The height of any point on a map can be determined by reference to adjacent contour lines. Elevations are further indicated on maps and charts by measured elevations for the peak of highest point of a mountain. The arrangement of the contour lines indicates the form of the land. The contour lines around a ridge point downhill, and those in a valley point upstream. The spacing of contours indicates the steepness of a slope. Contour lines close together indicate a steep slope, and contour lines which are far apart indicate a gentle slope. These are points for people who are traveling on foot to consider when planning a route.

"Distance Scales. How far is it from where you are to where you want to go? Maps give this information by providing the user with a scale which he can use to measure distance on the map. These scales can be used to find the distances between any two points on the map. Lay any available straight edge, a folded piece of paper, a string, or the edge of a pencil on the map so that it joins the two points. Mark on the edge of the straight edge the position of the two points. Lay the marked straight edge on the graphic scale and read off the distance directly. The same technique can be used to measure distance along a crooked course such as a road or river by breaking the course up into short straight segments.

"It should be kept in mind that proceeding as above will disclose the distance in miles (or feet) on the map only. When traveling across country on the ground, vertical distance as you climb or descend will add to the total distance traveled and will seem to equal - sometimes even exceed - the map distance. For this reason, the transition from air travel to ground travel is difficult for most fliers and ample allowance must be made for vertical movement when planning travel afoot.

"Longitude and Latitude. To describe a location in a city, the intersection of two streets is commonly used. Knowing the name of only one street establishes the general area of the location, but the intersection of two streets constitutes an exact location. In the same fashion, in order to locate a point on a map or chart you must indicate the coordinates of this particular point, in degrees of longitude and latitude.

"LATITUDE can be described as a division of the surface of the earth into North and South. An imaginary circle known as the Equator, drawn around the earth midway between the North and South Poles, serves as the starting point. The surface of the earth north of the Equator is divided into 90 equal divisions by circles drawn parallel to the Equator. Each circle is called a parallel of latitude and is numbered starting from 0 degrees at the Equator to 90 degrees at the North Pole. Any parallel of latitude north of the Equator is known as north latitude. The earth's surface south of the Equator is divided in the same manner and is known as south latitude. Each degree is further subdivided into 60 divisions, called minutes. Minutes are further divided into 60 divisions, called seconds.

"LONGITUDE can be described as an East and West division of the earth's surface. Longitude is measured in degrees east and west of a base line which passes through Greenwich, England. This line is a circle which passes through both the North and South Poles and is called the Prime Meridian. Longitude is divided into 360 equal parts, or degrees. If you stand on the circle passing through Greenwich and face the North Pole, the lines on your left are numbered 1 degree West, 2

degrees West, to 180 degrees West, and the ones on your right are numbered 1 degree East, 2 degrees East, to 180 degrees East. Longitudes 180 degrees East and 180 degrees West coincide.

"All navigational maps and charts are laid out in latitude and longitude. The position of any point on the earth is described as so many degrees and minutes east or west of the Prime Meridian and so many degrees and minutes north or south of the Equator.

"How to Use a Map. The information printed on a map can be used in any number of ways. In cases where extended travel must be accomplished, a map for planning the route and maintaining travel is extremely valuable.

"If you can position yourself on a map, which is a graphic portrayal of the earth's surface, you will provide the basic criteria for planning your travel. Three of the most important steps in movement across country will be:

1. To establish position prior to movement;
2. To determine an accurate destination; and
3. Be able periodically to pinpoint your progress and position.

To give an accurate picture of the country, a map must be oriented to agree with terrain features. The map can be roughly oriented by holding it so that you can see landmarks in their proper perspective on the printed map. This technique is known as inspection and is particularly useful to you while moving across country. Ideally, the map should be oriented with the help of a compass.

"Carefully study the map to determine the best route for your specific needs. The map will also provide information on the availability of water, and, to a degree, food, shelter, and safety. Learn in advance to use a map well - to predict what you will find when you arrive at some point you cannot now see - then when you have to rely on the map it will be of maximum value. To be able to select the route which will offer the fewest obstacles to travel, or which will provide maximum security, is of extreme importance."

The above passage was intended as a basic orientation; as such, the concepts developed should be useful in understanding the following sections. Again, for really detailed knowledge concerning the maps used in Ranger work, refer to the publication Topographic Maps.

Plotting of Coordinates. The general discussion of longitude and latitude suggests that any given point on the surface of the earth can be expressed

in terms of coordinates (i.e., in degrees of longitude and latitude). In Ranger navigation, precision in plotting coordinates is essential. For example, a typical 15-minute U.S.G.S. map represents a rectangular area measuring about 13 by 18 miles. Hence, a minute of longitude measures out to something just short of a mile, and a minute of latitude measures somewhat greater than a mile. For a Team engaged in intensive ground skirmish activity, an initial range of error of at least one square mile looms quite large... especially when we consider that the reported coordinates, when expressed to the nearest minute, may be in error to begin with! For these reasons, Ranger Teams usually find it necessary to employ the finer subdivisions - seconds - in ground operations. Of course, the source of the coordinates, Mission Headquarters, must take this necessity for precision into consideration, before issuing coordinates to a waiting Team. Since a second is 1/60 part of a minute, much greater precision is possible - and, by implication, more time will be saved over the total search.

The problem of translating a set of coordinates into a point on the map is compounded by the fact that the LENGTH represented by (say) one minute on a particular map usually differs from a one-minute length on another map, even though both maps have the same scale! To verify this fact, one needs only to observe a globe upon which meridians of longitude and parallels of latitude are inscribed, then try to imagine a rectangle of X degrees longitude by Y degrees latitude. The result will not be a perfect rectangle, although on a map such as the fifteen-minute series type, the area represented is sufficiently small as to diminish the distortion and hence closely approximate a rectangle. As a result of this distortion, the computation of a standard "conversion factor" from minutes to inches (on the map) would be difficult, since the relationship between minutes and inches varies from map to map.

Nevertheless, it is possible to precisely locate a point on a map from the given set of coordinates which represent that point. Upon inspection, it will be observed that all maps of the 15-minute and 7-1/2-minute series (and most other types as well) display certain degree marks on the margin of the map as reference points. On fifteen-minute series maps, these reference points occur every 5 minutes. In Figure 2.2-1, these reference points include 50 degrees 0 minutes, 50 degrees 5 minutes, 50 degrees 10 minutes, and 50 degrees 15 minutes of latitude, and another set of points for longitude. Note that minutes of latitude INCREASE from south to north, whereas minutes of longitude INCREASE from east to west.

If one wishes to achieve precision only to the nearest minute, the navigator can further subdivide the longitude and latitude reference points. In effect, he is "filling in" the gaps between reference-points and thus creating new reference points only 1 minute apart (as opposed

to the original 5 minutes apart). This subdivision can be achieved by measuring with a ruler or metric scale the distance from one reference point (e. g., 50 degrees 5 minutes) to the next one (50 degrees 10 minutes). This length is then divided by the number of minutes separating the two reference points (in this case, 5 minutes). The result (quotient) represents the length PER MINUTE of longitude (or latitude - they will DIFFER and must be measured separately!) for that PARTICULAR MAP. For example, if we find that the 5-minute segment of longitude measures 4 inches on the map, then 1 minute of longitude will measure 4/5 of an inch (or 0. 8 inches). In this example, then, 55 degrees 16 minutes would be 4/5 inches to the LEFT of the 55 degree 15 minute mark; 55 degrees 17 minutes would be 8/5 or 1-3/5 inches to the left of the 55 degrees 15 minutes mark, and so on.

It might be wise for the Ranger Team to mark IN ADVANCE these subdivisions on all maps covering its particular search area, so that there is no unnecessary waste of time during a mission.

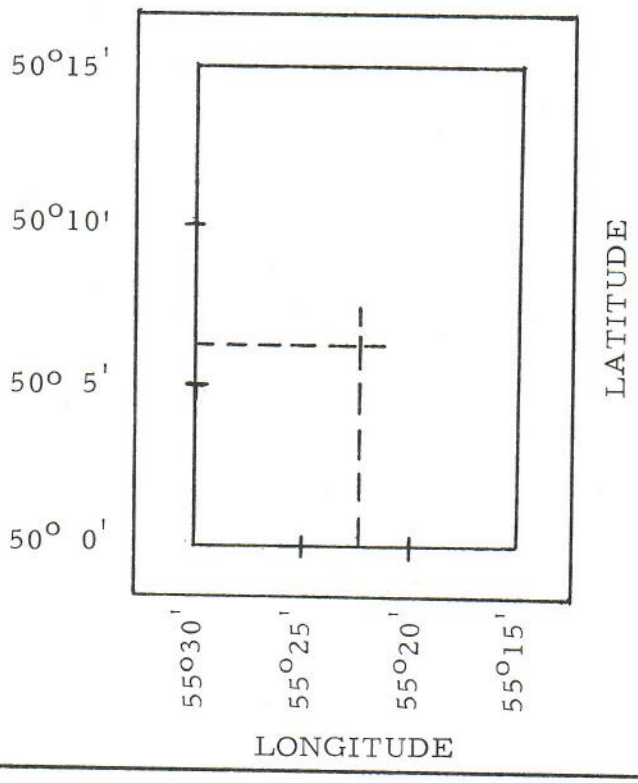
In a similar manner, the minute can be further subdivided into seconds, if necessary. Remembering that there are 60 seconds to the minute, we might translate a set of coordinates intuitively, if extreme precision is not warranted, due to other inaccuracies already existing. For example, we are told to find the point representing 50 degrees 6 minutes 31 seconds. 50 degrees 6 minutes and 50 degrees 7 minutes have already been located; observe that 31 seconds is reasonably close to a half-minute (30 seconds). Hence, by bisecting (dividing into two parts) the distance between 50 degrees 6 minutes and 50 degrees 7 minutes, a very close approximation to 50 degrees 6 minutes 31 seconds is reached. If the desired coordinate is 50 degrees 6 minutes 45 seconds, in a similar manner as above we see that this point is exactly 3/4 of the distance from 50 degrees 6 minutes to 50 degrees 7 minutes. Depending upon the degree of precision required, a "guesstimation" of this location is sometimes sufficient. The following problem should help to clinch the above principles:

PROBLEM: Locate 50 degrees 6 minutes 35 seconds Latitude precisely on the map (Figure 2. 2-1), assuming only the reference points 50 degrees 5 minutes and 50 degrees 10 minutes on the fifteen-minutes series map.

SOLUTION:

1. Measure (in inches) the distance between the points 50 degrees 5 minutes and 50 degrees 10 minutes.

2. Observe that 50 degrees 6 minutes 35 seconds is exactly 1 minute 35 seconds ABOVE the 50 degree 5 minute mark. Note further that this translates into 95 seconds (60 seconds + 35 seconds).



Lines drawn through the coordinates and parallel to the top and side edges of the map define the target location on that map. In this example, the desired coordinates are 50° 6' Latitude, and 55° 23' Longitude.

Note that degrees of Latitude increase from South to North; degrees of Longitude increase from East to West (right to left, on the map).

Fig. 2.2-1. Locating Coordinates on a Map.

3. Note that the number of SECONDS from 50 degrees 5 minutes to 50 degrees 10 minutes is 300 seconds (that is, 5 minutes X 60 seconds per minute = 300 seconds).

4. Finally, the desired coordinate is exactly 95/300 of the distance from 50 degrees 5 minutes to 50 degrees 10 minutes. In other words, 95/300 times the distance (in inches) measured in the first step yields the distance in INCHES from 50 degrees 5 minutes to 50 degrees 6 minutes 35 seconds. This calculated distance is measured with a ruler from the reference point 50 degrees 5 minutes on the map to find the exact location of the desired coordinate.

By this method, we have located the point representing 50 degrees 6 minutes 35 seconds latitude on the margin of the map. In a similar manner, the desired coordinate of longitude (whatever it may be) can be located. To find the point on the map defined by this PAIR of coordinates (one Latitude and one Longitude), a line is drawn through the Latitude coordinate parallel to the top edge of the map. Next, a line is drawn through the Longitude coordinate parallel to the side edge of the map. These lines intersect at one and only one point; this is the target location represented by the given coordinates.

In actual operations, the Ranger Team Commander is usually given a set of coordinates based upon pilot or observer debriefings; hence, the coordinates thereby obtained may be inherently inaccurate, due to faulty observation, lack of adequate navigation equipment, or similar problems. During SARCAPs and other training missions, the Team CO might find it worthwhile to emphasize the necessity of PRECISE location of the target in terms of coordinates. In doing so, much valuable time will be saved in the ground search effort. It has been the experience of the authors that pilots often fail to appreciate the difficulties of ground search operations - and VICE VERSA! Perhaps a great deal of cooperation in training might help to close this gap. In an activity where time is often a matter of life or death, mutual understanding between pilot and the Ranger Team becomes paramount in importance.

A Note on the Use of Other Maps. Although the Ranger most frequently uses the 15-minute series maps while in the field, obviously he should be able to locate himself on other maps - such as State road maps or Aeronautical Sectional Charts - as well. Further, each map case should include a master map, showing the position of each quadrangle in the State, in relation to the other quadrangles. These master maps are available, at no charge, from U.S.G.S. Each Team should obtain a current master copy each year, to keep its map supply updated.

For learning the use of the Aeronautical Sectional Charts, the Ranger should contact his local Aerospace Education or Training Officer; he should be happy to arrange for classes on this topic. In addition, any competent pilot will probably be able to supply the same information.

2.2.2 USE OF THE MAGNETIC COMPASS

This section is abstracted from AFM 64-3; it presents a basic introduction to the use of the magnetic compass. Specific instructions for the use of the lensatic compass (a special kind of magnetic compass) follow, in addition to more detail concerning applications of this information.

"Use of the Magnetic Compass. Direction is measured in degrees clockwise from north (360 degrees or 0 degrees) through 360 degrees. The most common instrument for measuring direction is the magnetic compass. Since most survival kits contain some type of magnetic compass, it is imperative that you know something of its use. Compasses will generally be marked in degrees from 0 degrees to 360 degrees; east is 90 degrees, south 180 degrees, and west 270 degrees. The easiest way to understand direction is to consider yourself to be at the center of a large compass. The 360 degrees of your compass dial are now 360 different paths or streets that you may use in following the map. The direction to a given point on the map is determined by measuring the

angular distance clockwise from north to that point. This angular distance, expressed in degrees, is the direction of that point from you.

"The term 'north' is usually considered to mean the direction of the North Geographic Pole. The compass needle points directly to the North Geographic Pole in only a few places on the surface of the earth. The reason for this is that the North and South Magnetic Poles do not coincide with the North and South Geographic Poles. In addition, deposits of materials in various regions of the earth keep the compass from pointing to the North Magnetic Pole. A magnetic compass, therefore, points not toward the North Geographic Pole, nor exactly toward the North Magnetic Pole, but to the magnetic north for that particular area. The difference between true north and magnetic north is called 'variation.' Variation is represented on a map by lines joining points of equal variation and is expressed in degrees east and west of a base line where the variation is zero. If you are east of this line your compass will point west of true north, and if you are west of this line your compass will point east of true north.

"The right and left borders of any map may be viewed as meridians of longitude. From the bottom to the top these borders are arrows pointing true north, with only a minor distortion resulting from the portrayal of a spherical surface on a flat plane. It may be seen that the map is a 'true' directional navigational aid which is to be used in conjunction with a 'magnetic' device.

"It naturally follows that the information from the two devices must be merged to allow for practical application. The procedure that accomplishes this merger is referred to as map orientation and is done as follows:

1. Place the map on a level surface and stabilize it.
2. Place the compass on the map in a manner that brings the true north-south line of the compass (sighting wire, compass straight-edge, etc.) into line with a north-south line of the map.
3. Now turn map and compass until the magnetic indicator (arrow or needle) of the compass is as many degrees east or west of the true north-south line of the compass as the variation which the area calls for. Variation may be stated or indicated on the map, or may be determined by using celestial aids.

"Once the map has been oriented, you can pinpoint your position by plotting azimuths on recognizable land features, either natural or man-made, as they appear on the map. It is best to use three such features, although two will give good results. This technique is known as trangulation and is performed as follows:

1. Identify the land features to be used and shoot an azimuth to it from your location.
2. Set your compass on the oriented map so that it points to the landmark on the map with the same reading.
3. From the landmark direct your attention back through the center of the compass, and
4. Draw a line from the landmark on this heading.

"If you repeat this operation using two or three known landmarks, your position on the ground (and on the map) will be where the lines intersect when using two points, or within the triangle formed by the lines when three points are used."

(Details and illustrations of triangulation are discussed in Section 2.2.5, under the subheading "Verification of Position.").

Use of the Lensatic Compass. The navigator's principal tool in moving from one point to another with moderately high accuracy is the lensatic compass. The name "lensatic" is derived from the fact that a lens is used to assist the user in observing the numerals on the dial, with a minimum of effort and movement to and from the sighting process. This instrument, which can be obtained at most Army-Navy stores at a nominal cost, is considered to yield sufficiently high accuracy for all Ranger operations. A Team would do well to buy at least two, one being held in reserve in case of damage to the other, or in case the Team is split into two navigation squads with separate assignments. When purchasing the compass, avoid the variety which has a plastic housing; these are somewhat cheaper, but they also lack the durability required in Ranger operations. Before continuing, the reader is directed to study Figure 2.2-2 to become familiar with the major operating parts of the lensatic compass.

Three situations will be invoked to illustrate the use of the lensatic compass. First, the navigator will be asked to determine the compass heading to a specific landmark (perhaps as a check on the accuracy of his progress). Second, he will be told to follow a given heading during daytime. Third, the navigator will be given a specific heading to be followed under nighttime conditions.

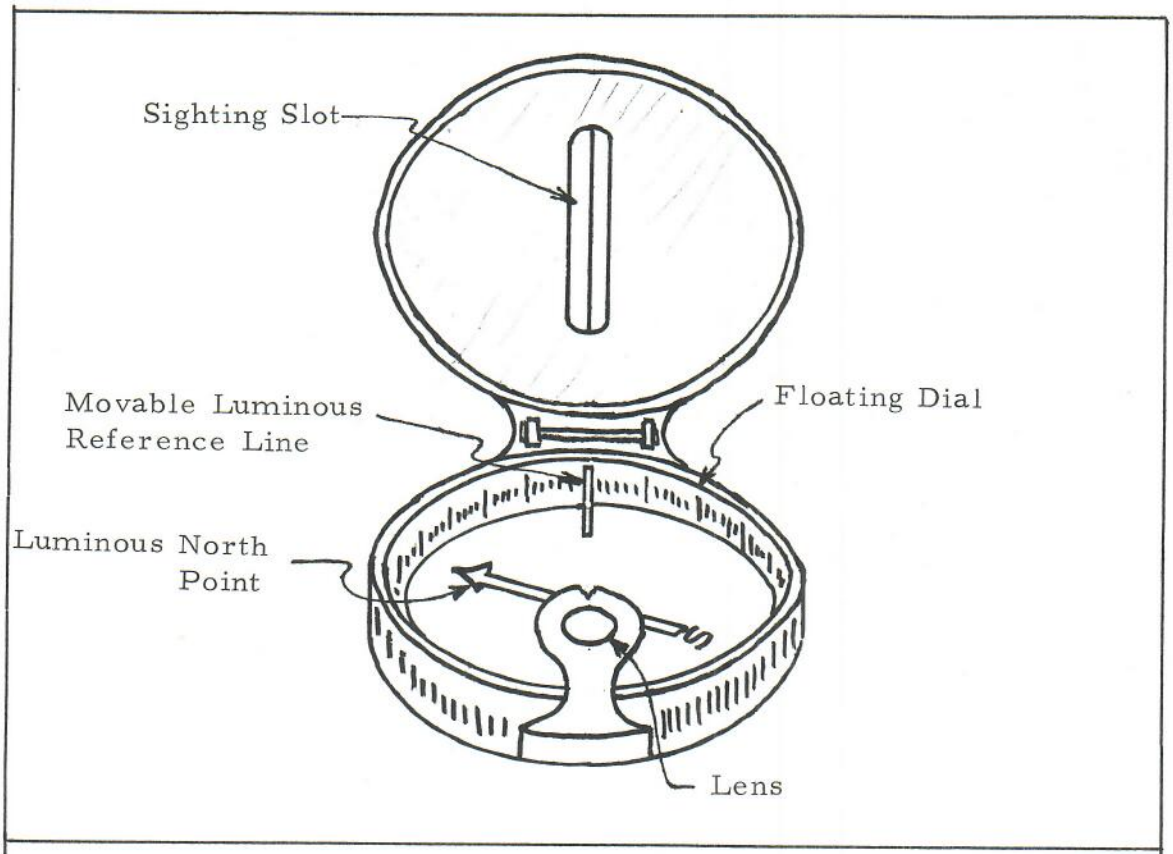


Figure 2.2-2. The Lensatic Compass

Finding a Heading. In finding the heading to some particular landmark, the user of the compass opens the cover and inserts his thumb through the metal ring. Next, the compass is "aimed" at the object, sighting through the notch above the lens and the cross-hair in the cover opening. In taking readings of this type, the phosphorescent reference line on the crystal of the compass is set in the twelve-o'clock position, as shown, to help pinpoint the final reading. To make sure that the reference line is in exactly the twelve-o'clock position, close the cover and determine whether the reference line is precisely aligned with the hair-line in the sighting slot.

After aiming the compass in the direction of the object, being sure that the needle is free-floating, allow the needle to settle down, while holding the sighting on the object. At this point we may discover that the compass has a "built-in" dampening system of some sort, or, conversely, that the needle oscillates freely for a seemingly indefinite period before coming to rest. In the latter case it may be discovered that there is a mechanical locking device which can be used judicially to reduce the wide swing of the needle. Another procedure (frequently used on ordinary "hunter's" compasses) is to briefly tilt the compass as the needle is swinging past the estimated final resting place. When the

needle has settled down to an oscillation of ten degrees or so, the user can guess fairly accurately where it will eventually stop. This reading is observed by glancing down through the lens onto the face of the compass. If the lens arm is adjusted properly, the user can glance down onto the face of the compass and back up to his sighting with only the roll of the eyeball.

As an illustration of the procedure described in the preceding paragraph, imagine that you must follow a heading of 165° MH* to reach the destination. A spotter is sent out in the approximate direction to act as a reference point. Meanwhile, you aim the compass in the approximate direction of 165° and, when the reading 165° comes spinning past the reference line, you tilt the compass if necessary to retard the swing. Next, the compass is gently returned to a level position, allowing the needle to swing freely once more. If your guessed direction of the heading was right on the nose, then the needle will only oscillate a slight amount about the 165° reading. If your guess was wild, however, you may need to rotate your body slightly in the appropriate direction to obtain the result of having the 165° reading oscillate about the reference line.

Following a Heading. When using a compass for following a predetermined magnetic heading, one simply takes sightings through the lens, rotating the body until the oscillation of the number representing the MH converges upon the reference-line (which has been set to the twelve-o'clock position. In navigation problems not requiring a high degree of accuracy, any object in line with the sighting - trees, landmarks, etc., can be used to establish the course. However, for a more accurate course, it is advised that a spotter be assigned to mark the direction. The spotter can be maneuvered until he is right "on course," and he is unique. That is, there may be many trees out there to confuse the navigator, but there will usually be only one spotter.

Night Navigation. Night navigation with the lensatic compass requires special techniques. The first of these requires discussion of the movable dial and its uses in this type of problem. Most lensatic compasses have a movable dial with one or more reference lines painted on in phosphorescent materials. These dials can be rotated, each "click" being equivalent to a three degree change.

In addition to the reference lines being luminescent, certain features of the dial are, also: most notably, the arrow indicating North. In the dark, even when aided by the glow of a red-filtered flashlite, the fine gradations of the compass face are difficult to discern. To facilitate reading the dial, one can make use of the movable reference line and the glowing North indicator. First, note that, if we were going in a direction of 0° (due magnetic north), we simply need to line up the North arrow

* Magnetic Heading

(by aiming the compass) with the reference line in the twelve-o'clock position. But, if we wish to proceed on a MH of 45°, observe that when we finally "home in" on 45°, the North arrow will be 45° counter-clockwise from the reference line. During the daytime, this constitutes no problem, since the user can focus on the gyrations of the 45° reading to determine the heading. After dark, however, this and other gradations are difficult to read. A solution is suggested by observing what happens when the reference line is moved 15 clicks to the left. Obviously, the reference line would then coincide with the position of the North arrow, when the user is actually facing 45° through the sighting crosshairs! So the rule is, after dark, set the position of the reference line to where the North arrow points, when one is actually aiming in the desired direction. Thereafter, the navigator need only glance down to be sure that the North arrow is lined up with the reference arrow, then look up and sight through the notch and crosshair to direct the spotter into position. Once the spotter is in position, the user glances down again to be sure that he has not inadvertently moved while concentrating on the position of the spotter.

With proper instruction and sufficient practice, all Team members can assume the responsibility of following a given heading, if the need arises. Indeed, all Team members must be well versed in this most elementary navigation practice.

The Spotter. Before proceeding, some mention should be made concerning the role of the Spotter in the navigation process. It has been stated that a quick and accurate method of navigating involves the use of an individual to serve as a reference point for the Navigator. This individual, called the Spotter, typically proceeds in the general direction of the course, as specified by the Navigator, as far as possible without getting out of sight. This distance will be determined by factors such as weather, ground cover, and terrain: hence, the common sense of the Navigator and Spotter alike will serve as the most effective guide.

While the Spotter is moving into position, the Navigator proceeds with the business of finding the precise heading, as discussed in the previous section. When this has been accomplished, and when the spotter has reached his approximate position, the Navigator issues orders to the Spotter, with the goal of aligning the latter on the course. These commands are given with reference to the Navigator; hence, if the command, "Two Steps Left!" (or a similar order, using whistle signals) is given, this is interpreted as two steps left WITH RESPECT TO THE NAVIGATOR. Obviously, if the Spotter is facing the Navigator, the Spotter must move to his (the Spotter's) right to achieve the desired position.

Even while the Spotter is moving toward his position, the Navigator can issue commands, such as "Bear, Left!" or "Bear, Right!" to

help align the Spotter. When the Spotter has been maneuvered into the desired position, the command, "Hold!" is given by the Navigator. At this point, the Navigator proceeds to the position of the Spotter. The latter, in turn, must await the arrival of the navigator before moving further. To expedite the navigation process, an additional Spotter is sometimes used to replace the first Spotter. In this case, the Spotters would operate in a leap-frog fashion, one holding the position determined by the Navigator, while the other moves ahead to "spot" the next sighting.

2.2.3 THE PRINCIPAL METHODS OF RANGER NAVIGATION

Given the target location, a number of methods may be used to reach this target. The prime determinants guiding selection of a method are time, terrain, familiarity with the area, and experience on the part of the searcher. That these factors influence each other becomes obvious; hence, TIME is usually the primary consideration in C. A. P. searches. A life may be at stake; therefore, the Team must move in the fastest possible manner to the scene of the crash (the "target location"). But the speed of a given Team will be influenced by the other factors - the terrain, and the experience of the leader (including his familiarity with the area).

The two most common methods of reaching the target (i. e., the two general types of Ranger navigation) are, in the terms of the pilot, PILOTAGE and DEAD RECKONING. Pilotage implies navigation without the use of a compass, whereas dead-reckoning relies on the magnetic compass or some similar radio-navigational aid. In many instances, a Team will have opportunity to employ BOTH methods in the course of an operation.

Pilotage. Use of pilotage implies a thorough knowledge of map-reading, along with a basic familiarity with the terrain. Rather than plotting a straight-line course from the jumpoff point to the target and then proceeding on a given heading with the use of the magnetic compass, the Ranger using pilotage "navigates" by observing certain characteristics of the terrain - including manmade landmarks - and proceeding on this basis alone. (CAUTION: All Teams should carry a compass with them, even under circumstances which only require pilotage-type of navigation!)

Hence, it may be observed (by reference to a topographic map) that the target is close to a stream, or a trail, or a gulley, or in line with a firetower. The possibilities are innumerable, and the shrewd Ranger Team CO takes every advantage of terrain features to implement the most rapid recovery of the target. On a recent Ranger Competition, a navigation problem was issued to several teams. The target was a bridge; all Teams were in unfamiliar terrain, but all had maps and basic navigation equipment. The Teams were dropped off in such a way that

each Team was not much more than a mile from the target, "as the crow flies," but the road distance to the target was several miles. The means of navigation was not specified by the competition Base Headquarters; as a result, some navigated with the aid of the compass, and some employed pilotage in solving the problem. By spotting a few salient features on the map - a marked trail, a gulley, a stream - at least one Team utilized their knowledge of map-reading and proceeded without the use of a compass. Another Team, under the assumption that accuracy of their dead-reckoning was about to be tested, began to navigate, using compass and line. The difference in time of arrival of the two Teams illustrates the point: the Team using pilotage arrived at the destination within an hour, whereas the other Team took over two hours.

Extreme caution must be exercised in the use of pilotage as a means of navigation. In the hands of an inexperienced leader, it may lead to a lost Ranger Team, thus hampering the search mission (not to mention the amount of embarrassment generated!). Also to be considered is the fact that not all targets are located conveniently to some natural or manmade reference point. Hence, although knowledge of terrain and use of reference points may be extremely helpful in some cases, the art of dead-reckoning must be mastered if the Team is to be effective under ALL conditions. (Incidentally, even the Team utilizing dead-reckoning as the form of navigation should take into account any available terrain features as a check on the accuracy of its dead-reckoning!) Given the importance of accurate navigation under all conditions, the next section will deal with dead-reckoning.

Dead Reckoning. For the purpose of discussion in this section, it is assumed in the beginning that there will be no landmarks to guide the Team in its navigation. The Team CO has been given a map with two points: a jumpoff point, and the target. The object is to plot a course from one point to the other. With this course, the Magnetic Heading, we will then be able to go into the field and, using the jumpoff point as the starting location, travel in a straight line for a given distance to the target area, using only a lensatic compass and measuring line.

In plotting the course, the basic tools include a protractor, straight-edge (ruler), geodetic maps, and a pencil. Additional tools such as a parallel rule, dividers, triangles, etc. may be useful under certain conditions, but they are not essential. Appendix 9 lists the contents of a field navigation kit required of all Pennsylvania Wing Ranger Teams.

The actual course-plotting process is quite simple in principle. The reader should begin by thinking of the jumpoff point as "Point A" and the destination as "Point B." After locating Points A and B on the map, we first connect them with a straight line. Next, a north-south

Step 1. Plot point A (the "jump-off" point), and point B (the target) on the geodetic chart.

Step 2. Connect points A and B with a straight line. This represents the course we will be taking. Also, draw a north-south line through the jump-off point (the point from which we begin our navigation). Note that the north-south line is PARALLEL TO the vertical edge of the geodetic chart (this indicates why it is useful to carry a parallel rule).

Step 3. Measure the angle θ with a protractor, reading CLOCKWISE from 0° (due North) to the line AB. This angle θ represents the TRUE HEADING (abbreviated "TH"). Before we can proceed in the field, however, the true heading must be converted to a MAGNETIC HEADING ("MH"), since we are using magnetic compasses in our navigation. This is accomplished by ADDING (in the case of westerly declination) the mean declination for that particular area to the TRUE HEADING.

REMEMBER: In areas of WESTERLY declination,

MH = TH + MEAN DECLINATION

Note: Since AB represents the course we will be taking, at this point it would help to examine the map carefully for indications of significant landmarks along the course. In this way, the accuracy of our navigation can be further verified.

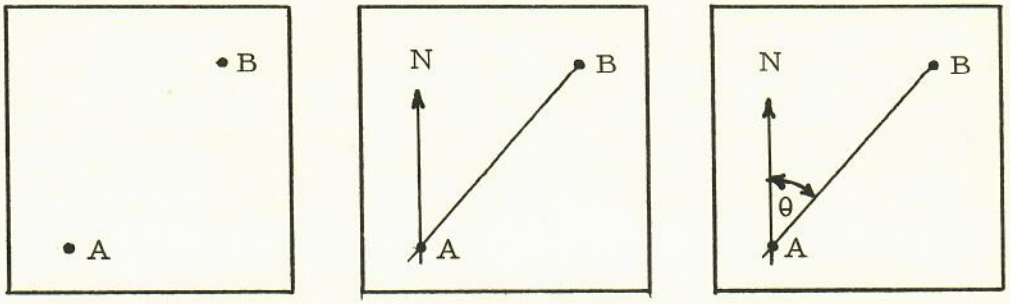
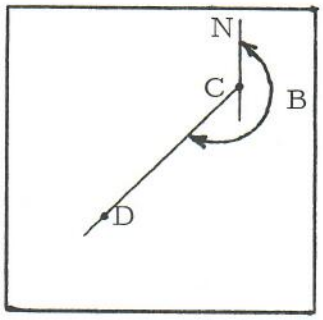
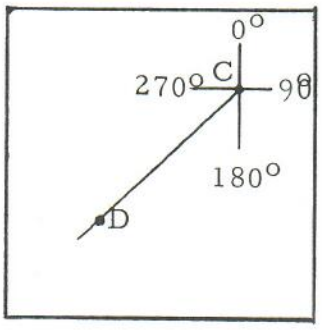


Figure 2.2-3. Determining a True Heading.

line is drawn through A as a reference for measuring the heading. The heading, represented in degrees, is that angle (designated as θ in Figure 2.2-3) formed between the north-south line and the line connecting points A and B. (When two points, such as A and B, are connected by a straight



Plot C and D on the map; connect C and D with the straight line CD. Draw a north-south line through the jumpoff point (in this case, point C). As in the previous example, measure the angle CLOCKWISE from the north-south line to line CD, and call this angle B. By observation, we see that B is greater than 180°; hence, the use of a circular protractor (See Appendix IX) facilitates the measurement of B. However, a standard protractor may also be used (carefully!) for this purpose. Measurement in this case indicates that B is about 225°; this represents our TRUE HEADING.



As a crude CHECK on our measurement, imagine the points of a compass superimposed over the jumpoff point (Point C), with C as the CENTER of the compass. Hence, due north is directly above C (0° or 360°), south directly BELOW (180°), and so forth. By imagining in this way, we see that the line CD falls between due south and due west (that is, between 180° and 270°). Since the MEASURED value obtained above is about 225°, this check assures us that our measurement is indeed at least "in the ballpark," so to speak.

Remember that the TRUE HEADING must be converted to MAGNETIC HEADING to be of use in the field. This is done in the same manner described in the preceding Figure and in the text.

Figure 2.2-4. Determining a True Heading: Another Example

line, that line segment is called AB, for sake of brevity). The degrees are counted clockwise from the north-south line until line AB is reached. It is assumed that the reader is familiar with the use of a protractor.

Note that the entire compass ranges from 0 degrees to 360 degrees. Consequently, the measured TRUE HEADING must fall within this range. Recall that "due north" is represented as 0 degrees (or 360 degrees); east is 90 degrees; south is 180 degrees; and west is 270 degrees. It must be emphasized that in determining a heading, the navigator measures the angle CLOCKWISE from the north-south line. In the first example, our heading was somewhere between 0 degrees and 90 degrees; this provides a check on the actual measurement. However, as illustrated in the second example (Figure 2.2-4), the heading may be in another direction. In this case, C is the jumpoff point, D the destination. As in the first example (and as in all cases), we measure the new heading by counting the degrees clockwise from the north-south line to line CD. The heading from C to D is observed to fall somewhere between 180 degrees and 270 degrees (due west), as a check on the use of the protractor in the above measurement.

The TRUE HEADING having been found, the only problem remaining involves the conversion of this heading to MAGNETIC HEADING (the heading to be actually used in the field when navigating with the magnetic compass). The REASON for the difference between the two courses was discussed in a previous section. If one is in an area of WESTERLY declination, then the number of degrees of declination must be ADDED to the true heading to compensate. If, however, you are in an area of EASTERLY declination, then the number of degrees of declination must be SUBTRACTED from the true heading. The result of either correction is the MAGNETIC HEADING; with this heading, we are in a position to move into the field. (The actual value in degrees of the mean declination for a given area is indicated in the lower margin of the geodetic survey map).

Course-Plotting Without a Protractor. Under many circumstances, an adequate approximation to the magnetic heading from one point to another can be found, using only a map and lensatic compass. The procedure is as follows:

1. Locate the starting point (A) and the destination (B) on a map, and connect these two points with a straight line. It is permissible and may be desirable to extend this line beyond both A and B. If a ruler is not handy, many substitutes are: the edge of this manual, for example.

2. Lay the map on a flat surface, and orientate the map (as described in Section 2.2.2). Don't use the hood or roof of a vehicle as the flat surface, however, since large masses of metal in close proximity will attract the compass needle and yield a distorted reading. Make sure that the map remains oriented, throughout the course-estimation process!

3. Next, set the reference line on the compass face in line with the cross-hair, open the cover of the compass, and lay it flat and as precisely as possible on the line AB on the orientated map (as in Figure 2.2-5). Align the cross-hair with the line connecting points A and B, while the dial of the compass is approximately over the starting point (A). When the compass needle (or rather, the whole dial of compass points) stops rotation, the number which is directly beneath the reference-line is the magnetic heading desired.

It cannot be overemphasized that, for this method to yield accurate results, the map must remain orientated and the compass lie flat, so that the needle can seek magnetic North unhindered. The heading obtained, since it is a MH, can be used directly in field navigation. If reasonable care is exerted in arriving at the heading, this method yields results accurate enough for most practical Ranger operations.

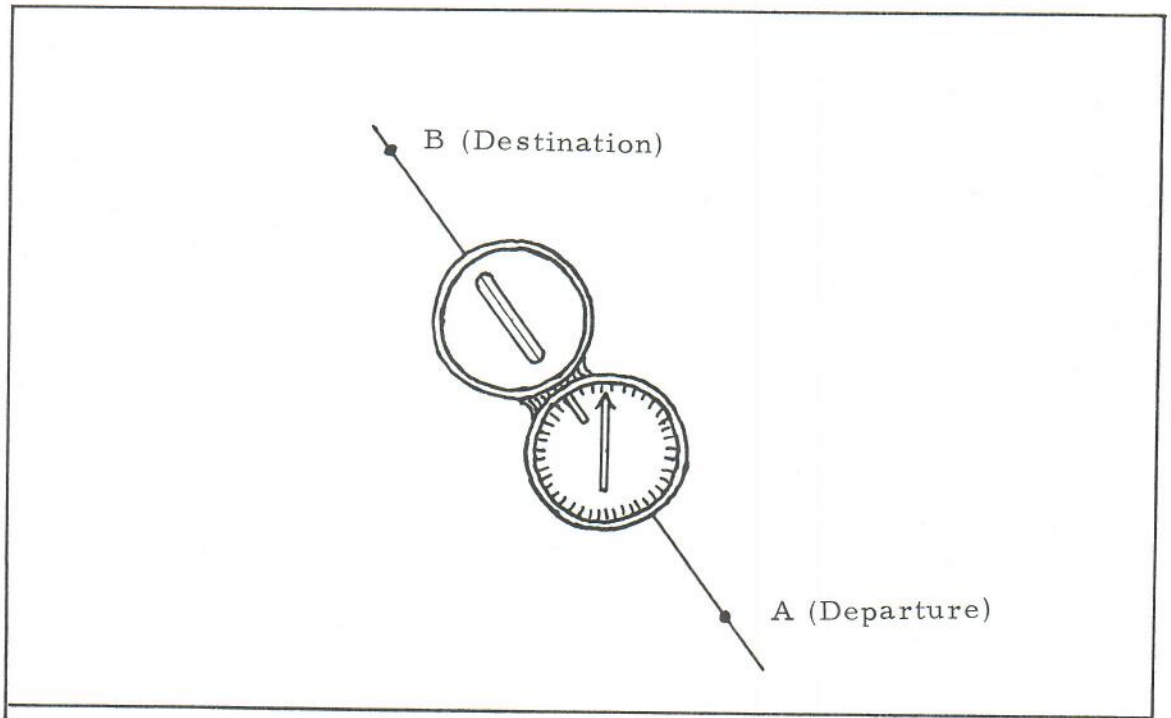


Figure 2.2-5. Finding a MH with Map and Lensatic Compass

To help understand and remember the method, it might be useful to imagine the following. Imagine that you were reduced to a very small size and actually placed on point A on the map, looking in the direction of point B. (Some kind soul has placed a flag at point B, so that you can see it clearly.) Since the map has been orientated, everything on the map is in proper relation to the "real world," when you are looking out from point A. So, how would you find the MH from A to B? You would

aim the compass at point B, allow the dial sufficient time to settle down, and take the reading directly under the reference line as the proper MH from A to B. This is precisely what we have described in the preceding paragraph. Only, since (obviously!) we can't reduce ourselves in size and stand on the map, we place the compass on the map in such a way that it is pointing exactly from A to B.

If upon reaching B we wished to return to A by following the same route (and, in addition, we have forgotten how to find a reciprocal course), the new heading from B to A can be found by orientating the map and then placing the compass over B in such a way that it "points toward" A. The new heading is then read directly from under the reference line.

A technical note: as long as the compass is pointing in the direction of the destination on the map and the hairline is aligned with the line segment AB, the compass can be aligned anywhere on AB and still yield the same MH. Hence, it is not necessary that the compass be centered exactly over the starting point. If a little reflection on the matter fails to convince the reader, a geometric proof can be supplied which will clinch the argument.

Reciprocal Course or Back Azimuth. Once the objective has been reached, it may be desirable to return along the same line that brought the Team in. Rather than recompute the new heading (from B to A, this time), we simply observe that a complete reversal constitutes a 180 degree turn. Hence, we either ADD or SUBTRACT 180 degrees from our magnetic heading to obtain the needed Back Azimuth. For example: Find the back azimuth of a Magnetic Heading (MH) = 90 degrees. In this case, add 180 degrees to get a back azimuth of 270 degrees. (Intuitively, the MH is taking us due east; hence, we would expect - and our expectation is supported - that the back azimuth will take us due WEST, or back to the point whence we came.) If the MH = 210 degrees, then we SUBTRACT 180 degrees from the MH to get a back azimuth of 30 degrees. The rule is as follows: if the MH is greater than or equal to 180 degrees, then SUBTRACT 180 degrees from MH to find the back azimuth. But if the MH is less than 180 degrees, then ADD the 180 degrees to the MH to get the back azimuth. (A knowledge of basic geometry reveals that either subtracting OR adding 180 degrees to the MH yields the same result, when converted to the 360-degree system.)

Limitations. Regardless of the amount of care exercised by the navigator, accurate pilotage and dead reckoning alone may not be enough to solve an actual field problem. It has been pointed out that various sources of error in computation of the original coordinates representing the target location can arise. In view of this, the following section discusses the importance and actual implementation of measurement of distance in the field as a technique in helping to complete the overall search effort.

2.2.4 MEASUREMENT OF DISTANCES IN THE FIELD

The necessity of measuring distances accurately is implied in the introduction to this section. Quite often, the coordinates received from Base Headquarters are only rough estimates of the location of the target. The pilots who made the sighting may not have had time to accurately pinpoint the crash site, due to unfavorable weather conditions, lack of natural reference points, or a number of other reasons. But the pilots can usually say, with some cartainty, that the target is within a given area; and, without further air support, the Ranger Teams must navigate a certain MEASURED DISTANCE to this area and then begin a systematic skirmish of the entire area (which also requires fairly accurate measuring in delimiting the search area). Having established the necessity of accurate measurement, the question arises concerning the implementation of measurement in the field situation.

The Measuring Line. The standard measuring line is a length of nylon parachute cord or some other suitable material. The overall length measures 30 yards; the line is knotted at 5-yard intervals for more precise measurement, and each of the three 10-yard sections of the line are of a different color, enabling the user to quickly determine what fraction of the entire length has been measured (See Figure 2.2-6).

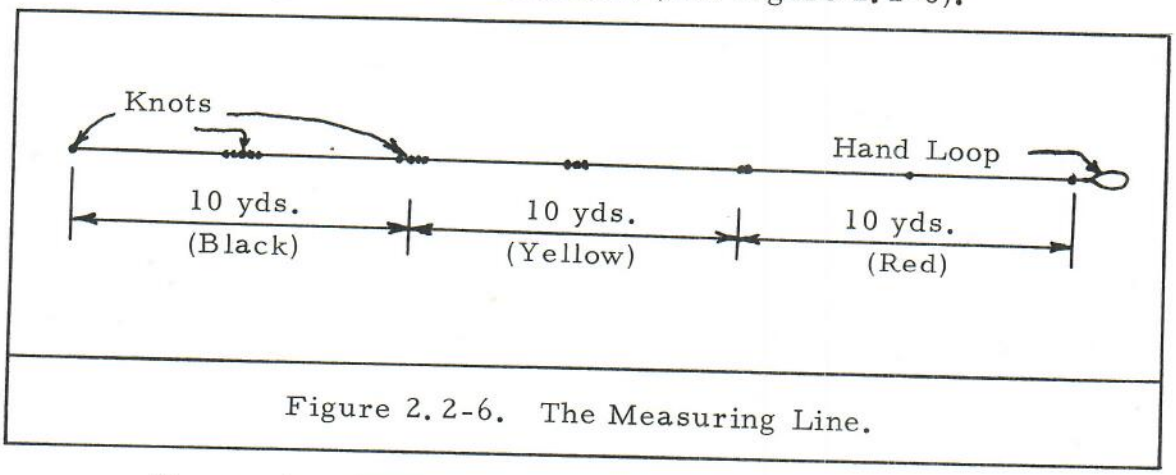


Figure 2.2-6. The Measuring Line.

Since nylon shroud-line has a high stretch factor, some Teams prefer different materials. Dacron line stretches considerably less, and hence is more suitable. At least one Team cuts a length of wire-core, plastic-coated clothesline to the approximate length for use as both measuring line AND a field antenna for their ANGR-694 radio (for monitoring 4467.5 mc).

If nylon shroud-line is used, the user must insure that the line is stretched tightly when measuring. A hand-loop should be provided at the lead end to facilitate use of the line.

Standard Procedure for Use of the Line. The following technique has been developed by the Pennsylvania Wing and has proven to be a very

effective and rapid means of using the measuring line. For the sake of clarity, this technique is described in three forms: pictorially (Figure 2.2-7), verbal diagram (Figure 2.2-8), and narrative. The three are meant to supplement each other, and to aid in the training process. A suggested method of learning the techniques to be described would be to secure the required number of personnel and then actually act it out, step-by-step.

Essentially what happens is the following. One Ranger (A) starts out in the direction desired, with the lead end of the measuring line in tow. The second man (B) accompanies A, while the third (C) stands fast on the starting point. When the end of the line approaches C, he shouts "MARK!" This tells A that the first length is almost measured. A then stops when the line is pulled tight (assuming a low-stretch line), shouts "CHECK!" and makes a recording of the check in his notebook. At this point, the first length (called a 'mark') has been measured. Ranger A again proceeds with the lead of the line, but B stands fast on the exact location where A stood when calling CHECK, and C moves rapidly to rejoin A. Hence, when the end of the line approaches B, he shouts "MARK!", and when the line tightens, A calls "CHECK!", and makes the recording. The second length (mark) has been measured. Before proceeding with the line, however, A must wait until C catches up (if C has not already done so); because C must stand at the new checkpoint. When C is in position, A once more moves out with the line, and B hurries to rejoin A at the lead.

Notice that B and C alternate jobs in a leapfrog manner - one marking the checkpoint, the other hastening to the lead (where A is waiting) and subsequently marking the next checkpoint. A has the task of forging through the brush in as straight a line as possible (in coordination with the compass team), while at each interval (checkpoint) he also records the marks of distance covered.

Note: Each mark indicates that a length of 90 feet has been measured. The person who is tallying checks (Ranger A) should be prepared to tell the navigator how much farther the Team must go, or how far they have already gone, before reaching the target. If the distance is initially computed in terms of marks, this task is simple. Hence, if the distance to be navigated is 15 marks, and the Team has already navigated 9 marks, then the navigator knows that only 6 marks remain to be travelled.

This technique seems to be the most efficient all-purpose method for overland measurement. It is possible, of course, that under certain conditions, a modification might produce a quicker (or less tiring) method; however, for the purpose of standardization, this technique should be mastered by ALL Rangers in C. A. P. Learning additional

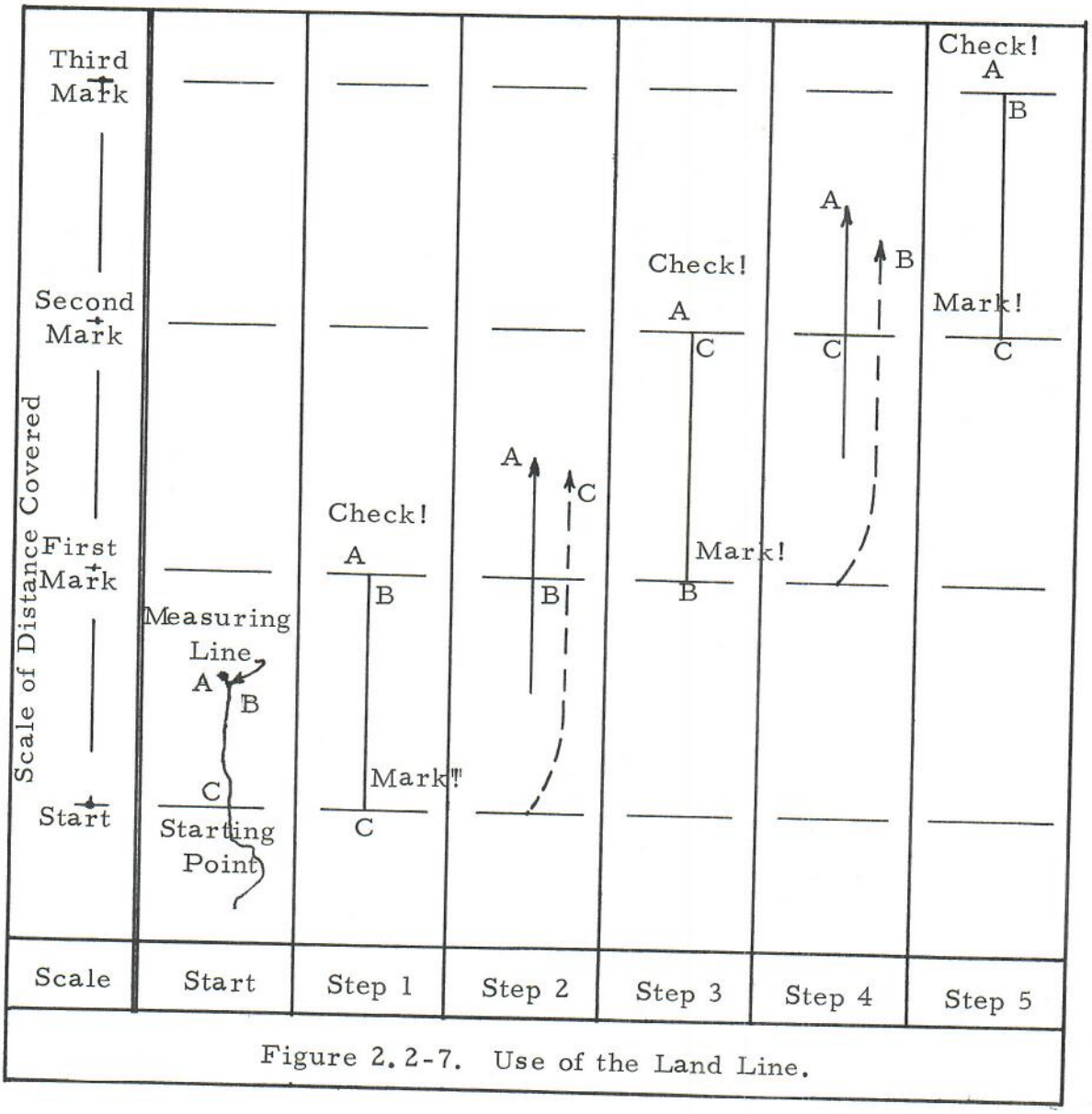


Figure 2.2-7. Use of the Land Line.

techniques is left to the option and ingenuity of the local units, where such additional methods might better facilitate the search effort.

2.2.5 THE RANGER TEAM IN ACTION: SPECIAL CONSIDERATIONS

Local Variation. In many areas of the Northeast, large ore deposits lie buried beneath the ground. Such deposits will cause a certain amount of needle deflection in all magnetic compasses being used in that immediate vicinity, sometimes to the point where dead reckoning becomes a futile effort. The existence of such sources of variation emphasizes the importance of constantly checking progress by referring to any available landmarks for clues indicating whether the Team is still on course.

STEPS	RANGER 'A' DOES	RANGER 'B' DOES	RANGER 'C' DOES
START	Proceeds with lead of measuring line	Accompanies A	Stands fast on starting point
STEP 1	Shouts "Check!" as line draws tight, and record distance covered	Prepares to stand on first check-point	Shouts "Mark!" as end of line approaches
STEP 2	Proceeds with lead of measuring line	Stands fast on checkpoint	Moves quickly to rejoin A at lead of line
STEP 3	Same as in Step 1	Same as in Step 1 for Ranger C	Same as in Step 1 for Ranger B
STEP 4	Same as in Step 2	Same as in Step 2 for Ranger C	Same as in Step 2 for Ranger B
STEP 5	Same as in Step 1	Same as in Step 1 for Ranger B	Same as in Step 1 for Ranger C

Figure 2.2-8. Description of Use of the Landline.

In a situation where compasses cannot be used due to extreme local variation, the Team CO must make full use of his knowledge of terrain and landmarks. In addition, the following technique will allow him to proceed in a relatively straight line, even in the absence of frequent reference points (See Figure 2.2-9).

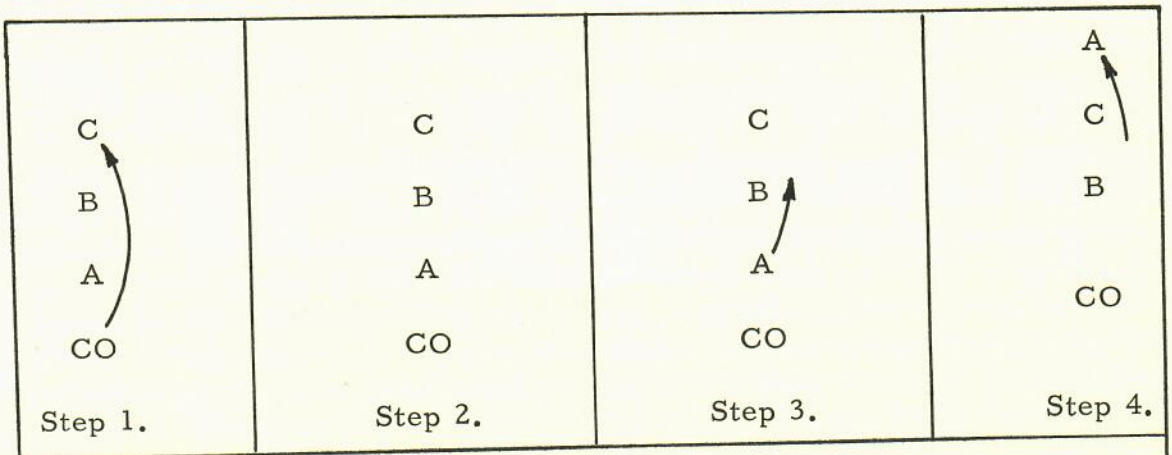


Figure 2.2-9. Maintaining a Course without a Compass

In Step 1, the Team CO aligns himself on a straight line directly behind A and B. From this position, he can direct C until C is also in line ahead of B.

In Step 2, C has been aligned.

In Step 3, B and C remain fast, while A proceeds to a point somewhere in front of C, and the Team CO moves to a point behind B.

In Step 4, the Team CO is again in position to give alignment directions to A (by sighting "through" B and C), thus keeping and extending the straight line.

In this manner, some semblance of a straight line can be maintained until further reference points are reached or the compasses become operative again. If manpower is at a premium, a modification of the above procedure, using two men instead of three, can be used.

Verification of Position. Any person with compass and geodetic chart can determine his precise location in coordinates if he has in sight at least two landmarks which are pictured on the map. In the illustration (Figure 2.2-10), a person standing at A sights two objects - a water storage tank and an aircraft beacon (B and C, respectively).

To find his location on a map, the Ranger begins by taking a sighting (with compass) on the first object (the water tower). The compass heading indicates that B is 300 degrees MH from his location. In his second sighting, the Ranger establishes that the beacon (C) is 45 degrees MH from his location. With these two headings, he then lays out the map and locates points B and C on the map. Since the Ranger is working from MAGNETIC headings, these must be converted to TRUE headings so that he can translate the headings onto a map. Hence, point B is 293 degrees TH and C is 38 degrees TH from A (since the mean declination in this area is reported to be7 degrees West).

The Ranger next observes that he is somewhere on a back azimuth from B and C. That is, if someone started from B and proceeded on the back azimuth of 293 degrees TH (which is calculated to be 113 degrees TH), this person would eventually reach A. Hence, the Ranger would draw a radius on 113 degrees TH from B, knowing that his position is located SOMEWHERE along this line. To find exactly where he is on the map, the Ranger takes the back azimuth of his second sighting (C) and, in a similar manner, draws that line on a radius from C. The intersection of these lines indicates the precise position of A on the map. The coordinates can then be read off by drawing a horizontal and a vertical line through point A to the margins of the map. See Figure 2.2-11 for an illustration of this process.

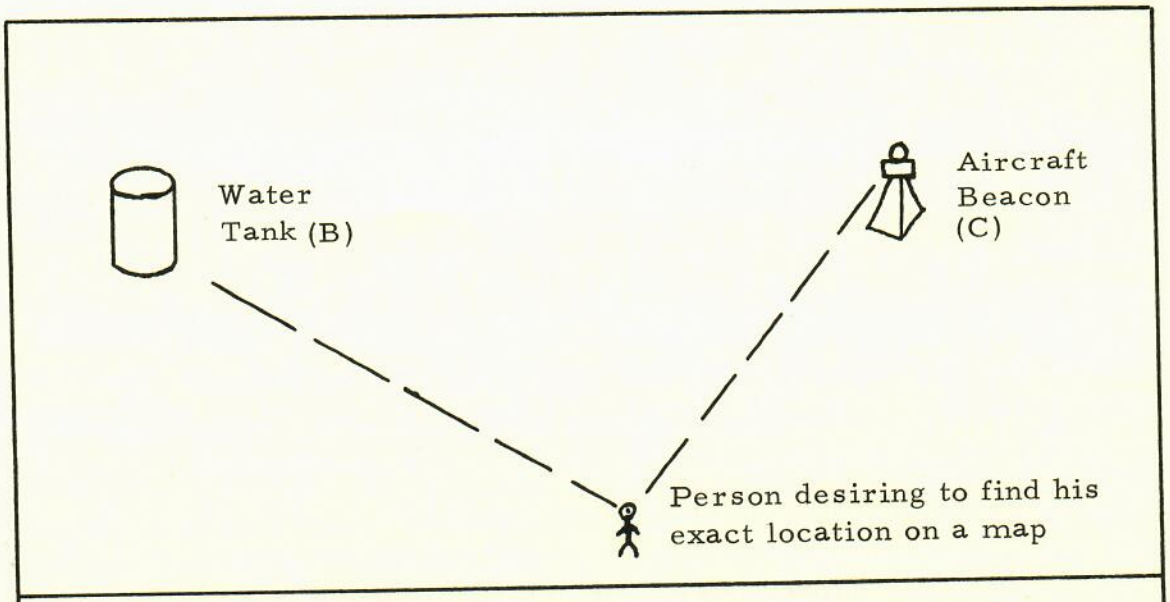


Figure 2.2-10. Verifying Position

On any complex or lengthy navigation problem, this technique serves as a cross-check on the accuracy of dead-reckoning OR pilotage. In addition, it can be used to determine the precise coordinates of the crash site (or campsite location) for the final mission report.

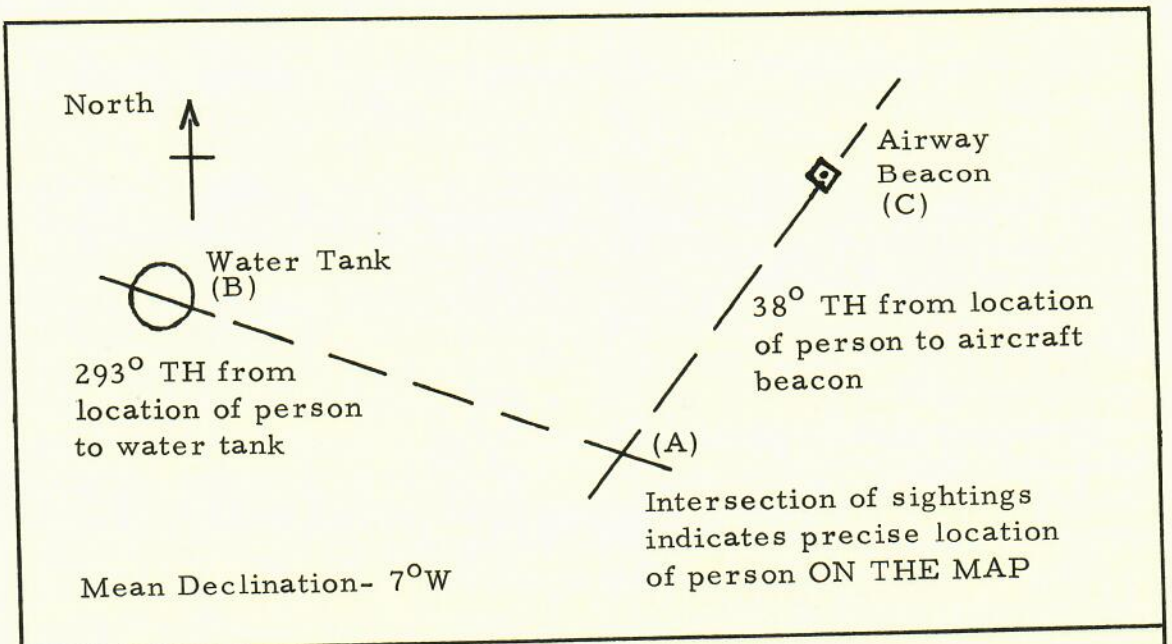


Figure 2.2-11. Map Representation of Figure 2.2-10

Night Navigation. Navigation under conditions of darkness poses problems requiring special equipment and slight variations in procedure. The following suggestions, in addition to regular navigation procedure, will enable the Team to operate under nighttime conditions:

1. All Team members should carry flashlights, which may be attached to the person or uniform, with an additional set of batteries. A flashlight enables the Ranger to see any obstacles in his path, thus reducing the possibility of accidents.

2. The Woodsman should carry a flashlight with a red globe and should wear a white tee-shirt or a light-reflecting panel over his shoulders, so that the Commander with the compass can take proper readings.

3. The Commander, using the compass, should wear a flashlight mounted on an elastic band that can be worn above the eyes, and equipped with a red lens. The colored lens enables him to read the compass, since a white light makes it difficult to see properly after turning away from the brilliant reflections made on the compass face.

4. The compass should have a luminous dial which would aid in establishing the proper azimuth.

5. Depending upon the terrain, it might be advisable to reduce the measuring line to 10 yards.

The Navigation Squad. Occasionally a search is requested which covers a relatively large area of land. One such mission in the recent past involved an aircraft which partially disintegrated in flight, scattering important parts over several square miles. Many Ranger Teams were ordered to participate in the search, but specialized Navigation Squads were employed to delimit the search areas in advance. In this manner, skirmish lines were able to move fairly rapidly through the delimited areas, not being slowed down by the time-consuming process of compass navigation and landline measurement.

The composition of the Navigation Squad includes the following personnel: a Chief Navigator, a Woodsman (who acts as a "spot" for the Navigator), three Linesmen to measure the distance covered, and an Assistant Woodsman to blaze the boundary line. In cases where time is an important factor (which is almost always!) an additional spotter might be used to expedite the navigation process. The only specialized equipment required of this Navigation Squad would be a Field Navigation Kit, the contents of which are listed elsewhere in this manual, and some device for blazing the trail.

It should be emphasized that the Navigation Squad could operate at night, under conditions of extreme urgency. Thus, when skirmish teams begin to arrive at the Advance Base the following morning, they can be deployed without delay to a given search area, the boundaries of which have been blazed the preceding night.

It is the task of the Mission Coordinator or his designated agent in charge of Field Operations to determine WHERE the boundaries are to be established, and how large an area each should cover.

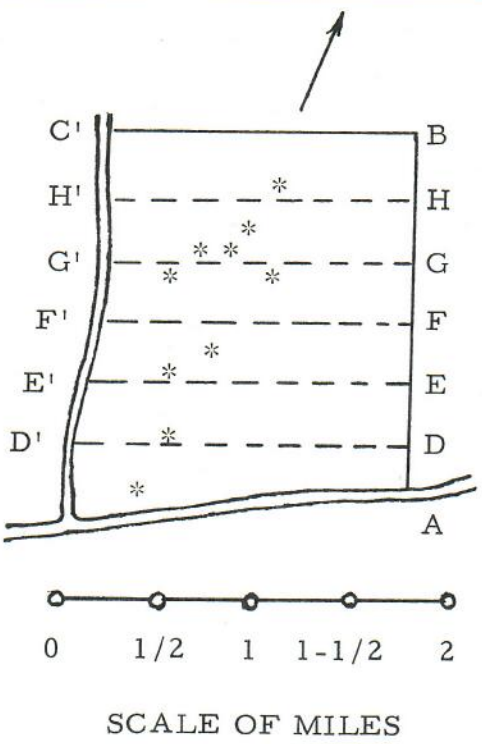
The Navigation Squad operates in approximately the following manner: The Chief Navigator takes up a position on the starting point (one corner of the area which has been predrawn on his map) and takes a compass reading in the direction of the first leg of the problem. In the meantime, the Woodsman moves out in that general direction as far as possible without getting beyond sight or hearing of the Navigator. When the Navigator has established the heading, he instructs the Woodsman to move to the right or left, until he (the Woodsman) is directly in the path of the first leg. The Navigator then moves to the location of the Woodsman and stands on the exact spot occupied previously by the Woodsman. The latter then moves farther out, while the Navigator takes another sighting. In the meantime, the measuring line crew proceeds from the starting point directly toward the spot occupied by the Navigator. The Assistant Woodsman follows this line, leaving a well-blazed trail to guide the searchers who are to follow later.

When the length of one "leg" of the area has been measured and blazed in this manner, the Navigator changes direction and begins the second leg. This process is repeated until the square (or rectangle) has been completed.

Of course, it would help to establish the search areas in such a way that at least one boundary is already established - a road, for example. Thus, in Figure 2.2-12, it would be wise for the officer planning the problem to have Navigation Squads blaze boundaries AB and BC first; subsequent Navigation Squads would move from A to D and blaze the line DD' out to the road. In similar manner, lines EE', FF', GG', and HH' are established. Note that about four square miles have been delimited.

The officer in charge of Field Operations then assigns skirmish teams, working from the area of greatest importance outward to those of lesser importance.

In many searches for lost hunters or children, dozens - or even hundreds - of civilian volunteers "show up" to participate in the search effort. However, the typical search of this type is often poorly organized



Arrow indicates flight path of aircraft.

Asterisks (*) indicate scattering of wreckage.

Figure 2.2-12. Large Area Search

and executed; often it amounts to many people wandering through the woods, shouting in the hope that the lost person would hear their shouts and respond. Such disorganization need not occur, however; by establishing boundaries in the above manner and by on-the-spot training of volunteers in skirmish procedure (using a few well-trained Teams as a base), C. A. P. can perform a real civic service by introducing efficiency and principles of organization into the search effort. However, the degree to which such an effort would be successful depends largely upon the experience of the Ranger Teams involved - and especially on the experience of their Commanders. It also depends upon the rapport established with other organizations in advance of an emergency.

Sources of Error. A navigation squad skilled in the use of compass and measuring line will nevertheless experience a certain amount of error in moving from one point to another on the surface of the earth. That is, completely aside from the matter of how well one plots the course, compensates for magnetic declination, and handles the line, at least three additional factors will influence the outcome of the navigation exercise: accuracy of the map itself; elasticity (or stretch) of the measuring line; and what might be called "error due to elevation changes."

Map Accuracy. Recent developments in cartography have greatly reduced the likelihood of serious misrepresentations in the relative

location of landmarks, symbolized on the map. According to Topographic Maps, National standards adopted in 1941 require that, for horizontal accuracy, "at least 90% of the well-defined map points shall be plotted correctly within one-fiftieth of an inch on the published map. This tolerance corresponds to 40 feet on the ground for 1:24,000 scale maps (i.e. maps of the 7-1/2-minute series) and about 100 feet on the ground for 1:62,500 scale maps." Similar standards were established to control error in elevation markings, as well.

To put this in other words, if we were given the task of navigating from one well-defined point to another, the maximum error that we would encounter through this source alone in using a 7-1/2 minute map would be around 80 feet, - or less than a mark of measuring distance. Of course, the chances are good that the error would be considerably less. Hence, for maps which conform to the standards set forth in 1941, we need not worry too much about the accuracy of representations which have not been disturbed since the map was last field checked.

The latter qualification is essential, since it is almost inevitable that many changes will have occurred since the time of the map publication. While it is true that most old landmarks will remain the same, the addition of buildings, rerouting of roads, and similar disturbances must be taken into account by the navigator. When encountering strange territory, the Team CO would be wise to consult the natives of the area to determine whether, say, the crossroads he wishes to use as a jump-off point is actually the one indicated on the map.

At least one Ranger leader placed himself in the embarrassing position of following a fairly recent map and ending up several miles from where the map indicated he should have come out. For half the preceding morning, the individual had been insisting on the typically high level of accuracy of topo maps, to the skepticism of his less-convinced partner. The discrepancy arose largely as a faulty interpretation on the part of the leader, however. The road he followed had been improved and widened to give access to a new gas-well drilling site. Of course, the leader followed the new road (graded) since it appeared to follow the course of the original one quite well. In fact it did follow the original path quite well----for a distance. Unfortunately, the leader failed to note the point where the new road deviated from the original path, and entered a different valley!

What can be learned from this experience? First, one should always make use of all landmarks available to confirm the accuracy of his path. As things turned out, all other features of that map were represented with impressive accuracy. Even the bend where the new road deviated from the old course could have been located (the road was somewhat overgrown at that point and hence overlooked on the first trip

through) from map information, since other features - a state forest boundary marker, a bench-mark, and the like, were indicated as being on the original road--and, in fact, they were there! In their haste and over-confidence, the leader and his partner blundered on without checking their progress, and, as a result, an entire morning was wasted.

Second, even the most recent topographic maps should be suspect, since we live in a dynamic era of new construction. Hence, be wary of such changes, particularly in using roads and buildings as jump-off or reference points. Make full use of the information contained on the map. Even the older maps are useful to a degree, since many terrain features and other characteristics will not have changed. (Although a hamlet indicated on a 1918 map may have become a thriving city in the interim). Finally, trust the map, with these limitations in mind. Even an out-dated map can be highly useful to a good navigator who understands its limitations.

Elasticity of the measuring line. The problem of stretch of the measuring line has been mentioned in a previous section. This potential source of error can be reduced to a minimum, if one takes the average amount of stretch into consideration before calibrating the line. A Team using such a line should actually stretch the line to the average tension which will be used in the field, before marking distance measurements on it. If this is done properly, and if the line is stretched to this approximate tension when in actual use, then the stretch errors will tend to "cancel out" over a substantial distance.

With these points in mind, the navigator is faced with still a third - and perhaps less controllable - source of measurement error: error due to elevation changes.

Error due to elevation changes. It has been observed that a map is a two-dimensional representation of a part of the earth's surface, with all distances in the original survey measured on a horizontal plane. That is, in measuring such distances (whether North-South or East-West), the surveyors, in making the map, held their measuring tapes in a horizontal position, regardless of terrain fluctuations. The resulting measurements were then plotted on the map.

On the other hand, when the navigation squad proceeds from point to point, the measuring is done "overland " following the ups and downs of the terrain. This is shown in Figures 2.2-13 and 2.2-14. The map distance from A to B is the horizontal projection ("x" in Figure 2.2-14), while the navigation squad, in measuring the distance, proceeds up the incline, measuring on the ground. Note that, if the map distance is given, the team, to reach B, must actually measure a slightly greater distance in their "overland" travel. This extra distance is to be called

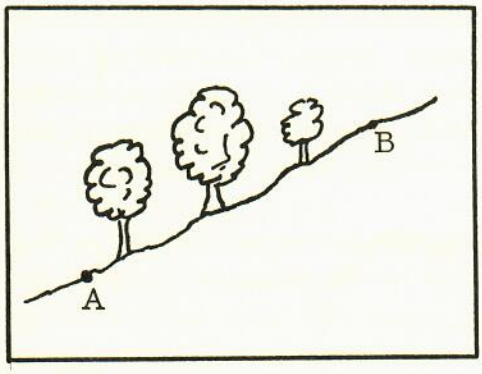


Figure 2.2-13. Cross-Sectional View of a Hill

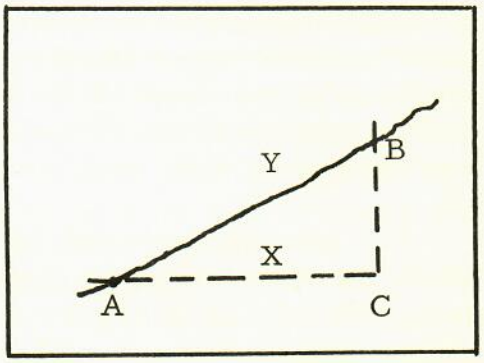


Figure 2.2-14. Representing Geometrical Relationship Involved

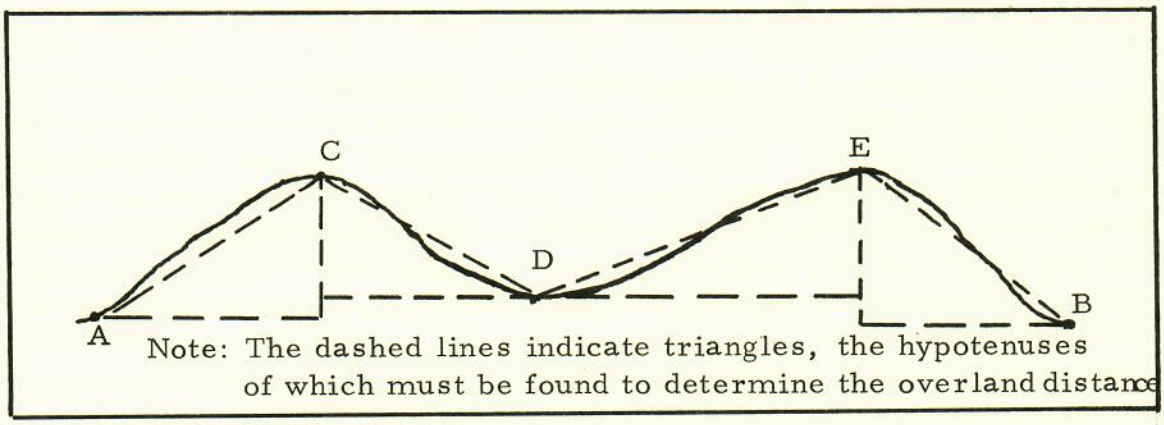


Figure 2.2-15. Navigation Errors over Rolling Terrain

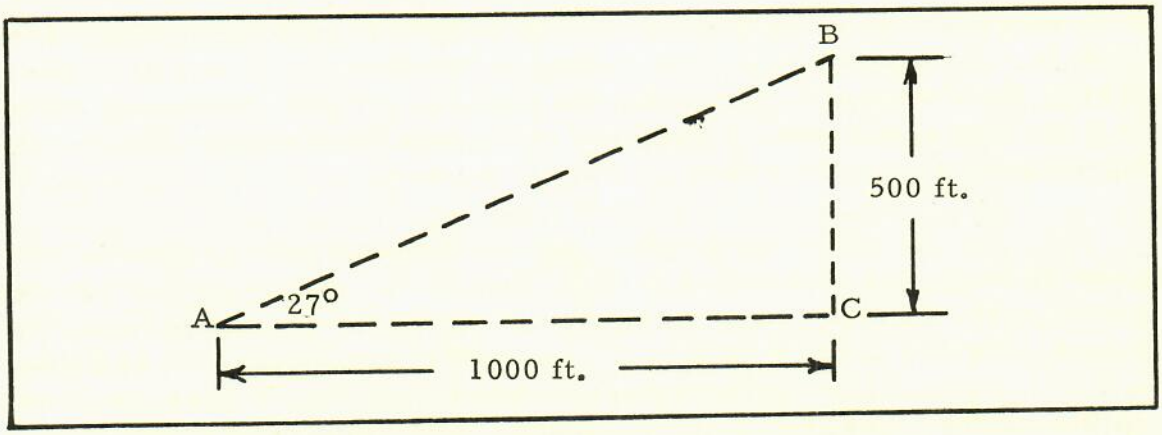


Figure 2.2-16. Finding and Using the Error Factor.

the "error factor," and it is always additive except where the terrain is level (in which case, the error factor becomes zero). Note that if one were measuring downhill, as from B to A, the identical principle holds, namely that the Team, in measuring "overland" is really measuring the hypotenuse of a right triangle of which the "x" distance, or base, is the map distance. Incidentally, note that the difference in elevation between A and B is the distance BC, which can be read from the contours. The difference in length between the hypotenuse and the base is, as mentioned above, the "error factor."

To spare the Navigation Squad (or Base Headquarters) the agony of working through this error factor for a specific problem, Appendix 8 presents a table indicating this error factor for many map distances and changes in elevation. Concerning the use of this table, two points should be noted: First, the table (and the above discussion) assumes a fairly constant change in elevation from point A to point B. Second, it is assumed that measurement is being made in one direction - either uphill or downhill. Unfortunately, most problems do not conform exactly to these specifications. Points A and B might be separated by one or more hills of varying slope, as in Figure 2.2-15. In such a case, the problem must be broken into segments on the map. In Figure 2.2-15, the overland distance from A to B is the sum of the line segments AC, CD, DE, and EB. Fortunately, the map and the table in Appendix VIII provides the necessary information from which each segment can be quickly computed.

Careful observation of Figure 2.2-15 reveals that even this computation of the error factor is, in all practical cases only an estimation - albeit a good one. Obviously, most hills do not change elevation uniformly from base to top. The computed "overland distance," then will still fall somewhat short of the real "overland distance." However, a glance at the error factors in Appendix VIII indicates that, in many cases, the correction greatly improves the precision of the measurement.

A legitimate question might be raised at this point: When are all these considerations (i.e. those relating to the error factor due to the changing elevation) really of use to the navigator? To answer in the negative - when the terrain is fairly flat; when the distance between A and B is quite small; when maps are available to provide visual check points as an indication of the Team's progress: under these conditions, this source of error will probably not be worth taking into consideration. But if the Team must navigate on a predetermined heading and for a given distance over rolling hills or more rugged terrain, without maps or knowledge of the area to act as a guide, then the individual issuing the distance to be measured (the mission coordinator, field problem commander, etc.) had better make the appropriate corrections in his computations, so that the specified distance will more nearly approximate the actual distance from the jumpoff to the target location.

As a final example, consider a change of elevation of 500 feet over a distance of 1000 feet (about 1/5 mile). This change in geometric terms, would constitute a slope of about 27° (See Figure 2.2-16). The map distance will be 1000 feet. The change in elevation is 500 feet (as indicated by contour intervals on the map). With this information and the table in Appendix VIII, we find that the error factor is 118 feet. That is, the overland distance from A to B is at least 118 feet greater than the indicated distance. Hence, we would really have to travel 1118 feet from A to reach B. Over this short distance, then, a discrepancy of at least 1.3 marks (118 feet) occurs. If we only need to navigate over 1000 feet, then, this discrepancy will not be worth taking into account, for most practical problems. However, if the Team was to navigate 5000 feet (nearly a mile) over similar terrain, the error would compound to about 590 feet - or almost 6.6 marks. Such a discrepancy could easily affect the course of a mission, especially when the Team has no map against which progress can be checked.

Subsequent discussions in Section 3 will make use of the information provided in this section, with emphasis on the teamwork aspect in actual land search operations. The points mentioned in the preceding subsections, especially those under "Additional Sources of Error" form a transition point from individual to group (team) skills. Their inclusion in this chapter was felt necessary, since each Ranger must develop a detailed appreciation of such considerations, before he can apply them to a given situation for Team use.

To cite a particular example illustrative of the need to incorporate this knowledge at the individual level, we might imagine the situation of a woodsman being sent ahead to "scout" an area, to determine a good means of searching or even traveling through the area. If the woodsman is skilled in the art of map reading, and if he understands the principles discussed in this section, then he will be in a much better position to advise his leader accurately upon his return from the advanced area.

SECTION 2.3
MEDICAL

First aid is defined by the American Red Cross as the immediate and temporary care given to the victim of an accident or sudden illness until the services of a physician can be obtained. The necessity for a thorough knowledge of first aid by all Rangers to perform rescue functions is obvious. Perhaps less apparent, however, is the role of first aid training in the prevention of mishaps. Since many excellent first aid courses are available, no attempt will be made here to present a comprehensive first aid section.

Of the more presistent problems encountered by Rangers, only a few are discussed in this section. Of particular interest to Rangers are those maladies which might cause an entire Team to be "sidetracked" from an important mission, to come to the aid of one careless fellow Ranger who has been stricken. Rather than a rescue orientation, then, the focus here is on you and your well-being. By avoiding the dangers of the maladies discussed below, the Ranger is actually increasing the likelihood of his Team completing its mission successfully. But, since only the most frequent threats to Rangers are discussed, the section is intended only to supplement, not replace, regular first aid courses. Ultimately, the Ranger must be prepared to solve any first aid problem quickly and efficiently, if he is to satisfy the "rescue" function of the Ranger Team.

2.3.1 FROSTBITE

One of the greatest winter hazards in cold climates is frostbite. Not only are lost persons apt to get it, but Ranger personnel searching for them may be stricken. Frostbite is essentially the freezing of some portion of the body and can be extremely serious. Since the Ranger who gets frostbite becomes a victim and thus affects the performance of the entire Team, it is very important to understand not only what frostbite is, how to recognize it, and how to treat it, but also how to prevent it.

How Frostbite Occurs

Frostbite occurs when one part of the body becomes excessively cold. When the temperature in that body area falls seriously below normal, blood circulation through the capillary system ceases. Without blood circulation to bring warmth, the affected area rapidly becomes much colder. The skin and then the flesh become hard and white. The area becomes numb. Areas most susceptible to frostbite include the extremities (fingers, hands, toes, feet, ears, nose) and also areas especially exposed to windchill (nose, cheeks). Extremely rapid frostbite can come from windchill or from touching cold metal with bare skin.

Why Frostbite is Dangerous

Frostbitten areas of the body are receiving no blood and therefore no oxygen. Certain germs, notably those causing gangrene, are anaerobic, that is, they thrive when oxygen is absent. Thus, many infections, including gangrene, can get a good start in a frostbitten area. In addition, the body cells in the area are not receiving oxygen and also are not having waste materials removed. Fortunately, since these cells are also cold, the situation is not as serious as it would be, were they at normal body temperature. Infection after frostbite is as serious as infection after a burn. Both should be treated by doctors to prevent the infection from starting. Delay in treatment may easily result in amputation of a limb.

How to Treat Frostbite

There are three phases in treating frostbite. The first is to move the victim to a warm, sheltered place and provide general warming procedures for his body (hot soup, blankets, etc.). The second is the act of warming up the affected area. This may be done in the field if qualified personnel and equipment are available. ONCE THIS TREATMENT HAS BEEN STARTED, IT MUST BE CARRIED THROUGH. If the treatment cannot be carried out without interruption, do not start it, but evacuate the casualty to a hospital. In this latter case, keep the casualty warm but do not try to thaw out the affected areas. (Once thawing starts, the demand for oxygen is reestablished, and blood circulation must also be restored or serious damage will result.) One other precaution: using too much heat will cause cell damage. The temperature of the water used to warm the area must not exceed 112°F. (A thermometer for measuring this temperature is a must.)

- Immerse the afflicted area in warm water (104-106°F). This will cause great pain for a while, but the victim will just have to "grin and bear it." For areas that cannot be immersed (face, etc.) warm them with cloths soaked in warm water, or use body heat to warm them. (Place them next to your belly, or under your arms, etc.)

- DO NOT MASSAGE afflicted areas. Much mechanical damage can be done to the frozen tissue without the victim feeling a thing.

- Continue the warming treatment until the areas feel normal and full feeling is restored.

- Give supportive treatment throughout; i.e. keep the victim warm, give him warm liquids to drink (soup, broth, hot chocolate, etc.).

- Aspirin may be given for pain, but DO NOT GIVE ALCOHOLIC BEVERAGES!

The third phase in treating frostbite can only be carried out by a doctor and/or a hospital. This is the prevention or treatment of infection. It is essential that frostbite victims see a doctor after they have been treated for frostbite.

How to Prevent Frostbite

- Have a complete understanding of all aspects of frostbite.
- Dress for the lowest temperature that can be expected.
- Keep your body warm. If your body gets cold, blood circulation to the limbs is reduced to conserve heat. This makes the limbs more susceptible to further cooling.
- Wear layers of clothing rather than one heavy item. Layers can be removed gradually to suit your clothing to temperature and activity level and also serve to trap air. Dead air space is one of the best insulators. (See Section 2.1.3)
- Keep dry at all times. This includes not only wetness caused by rain or snow, but even more so from perspiration. When wearing rubber boots, check your socks often to make sure they are completely dry. Rubber boots make the feet sweat profusely during periods of activity. It is a good idea to carry a number of pairs of extra socks with you and to change them frequently. If you do any work, open your clothing briefly to let out the moisture-laden air. Button up immediately afterwards to prevent getting a chill. Wear only enough clothing to keep you warm enough for your activity level.
- Check your buddies and have them check you periodically for signs of frostbite. Since it numbs the nerve endings, frostbite can sneak up on you without your knowing it. (The presence of white spots is one warning of frostbite.)
- Eat well, drink plenty of water, and get enough sleep to keep you alert and in good physical condition.

For a more detailed discussion of frostbite, see Frostbite by Bradford Washburn. (Check References section.) Each Ranger Team should have a copy of this pamphlet available.

2.3.2 HYPERVENTILATION

Hyperventilation is an affliction caused by too rapid, sustained breathing. It usually results from nervousness, apprehension or anxiety. It can accompany physical exertion under stress. (It is common among fighter pilots engaging an enemy aircraft.) The over-breathing reduces the carbon dioxide level in the blood. This does two things: it reduces the ability of the hemoglobin in the blood to give oxygen to the body cells, and removes the "trigger" that tells the body that it is time to take a breath. The person will first lose control of the extremities (fingers) and may lose consciousness. Nature will eventually restore the proper balance in the bloodstream, but the effect of losing consciousness may be bad. (The fighter pilot may crash, for example.)

Prevention

- Allow periods of rest after extreme physical activity.
- Act to remove fears and anxieties in individuals engaged in physical activities.
- Keep alert to symptoms in yourself and others.

Symptoms

- Skin has a rosy-red color.
- Victim is "overbreathing" before being affected.
- If unconscious or nearly so, victim will be hardly breathing at all. Pulse may be impossible to find. Heart will be beating very slowly.

Treatment

- Have victim lie down. Keep him warm and covered until fully recovered.
- Use an ammonia capsule or face-slapping to shock the victim out of "panic" breathing if he is doing this.
- Have victim breathe into a paper bag held over his face. By rebreathing this air, he will build up a proper carbon dioxide level in his bloodstream sooner. As soon as the victim complains about the bag, remove it.
- Treat for shock.

Victims of hyperventilation will eventually recover if they are left by themselves. They may be weak afterwards, however, and should be treated for shock in any eventuality.

2.3.3 EXCESSIVE HEAT

Exposure to excessive heat, especially while engaged in vigorous physical exertion, can lead to two serious afflictions: heat exhaustion, and heat stroke. These are especially common in Northern regions of the country where individuals who are not accustomed to high temperatures occasionally experience a "heat wave" in the Summer. These people fail to properly regulate their activities during the heat wave and fall victim to the heat. Rangers in the field are particularly vulnerable to heat exhaustion during Summer activities. Heat stroke, while not as common among youth, is also a possible threat in Ranger activities. Rangers, and especially Ranger Team Commanders, should be very aware of this problem, and regulate activities accordingly. Salt tablets, followed with at least a cup of water, will do much to mitigate the effects of heat.*

Heat Exhaustion and Heat Stroke

Heat exhaustion and heat stroke both result from strenuous activity during hot periods. That is where their similarity ends. Their symptoms and consequences are radically different. While heat exhaustion (the more common) is usually a relatively mild condition, heat stroke can easily be FATAL.

Heat exhaustion is somewhat like traumatic shock, with many of the same symptoms: possible nausea, cold and clammy skin, often profuse perspiration, normal body temperature. Heat exhaustion cases that do not respond to first-aid treatment should be evacuated to medical authorities, since the affliction can be serious.

Heat stroke is (as the word stroke implies) deadly serious. Medical care should be sought immediately. The high fever, dry skin, and rapid pulse all suggest serious sickness. Even if the victim "recovers" following first-aid, he should be treated by a doctor.

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* A word on salt tablets: They must be followed with a large drink of water. Recommendations vary between one cup and one pint. Some people become nauseous from salt tablets. A slow-dissolving, cellulose-impregnated tablet can remedy this. They are available from: U.S. Safety Service Co., 1535 Walnut St., Kansas City, Missouri, 64108.

Preventive Measures

Preventive measures for both heat exhaustion and heat stroke are the same; don't overload your body's cooling system.

- Regulate all activities, keeping in mind that excessive heat and humidity precipitate cases of heat stroke or heat exhaustion during too much physical exertion.
- Drink more water than normal during hot weather and high physical activity.
- Increase salt consumption, either with tablets, or over-salting food. (Note: increased salt consumption must be accompanied by increased water consumption.)
- Maintain a well-balanced diet, without over-eating.

Symptoms

Symptoms of heat exhaustion and heat stroke, listed below, differ widely:

Heat Exhaustion	Heat Stroke
• Normal body temperature	• High body temperature (maybe 106°F)
• Cold, clammy skin	• Dry skin
• Nausea	• Rapid pulse
• Weakness, "tired" feeling	• Dizziness or fainting
• Profuse perspiration	• Often headache, sometimes nausea

Treatment

Treatment, like symptoms, is also different for the two afflictions.

Heat Exhaustion	Heat Stroke
• Provide immediate rest	• Provide immediate rest
• Administer salt solution if conscious (See First Aid manual for mixture)	• Administer salt solution if conscious (See First Aid manual for mixture)

- Seek medical help in severe cases
- MOST IMPORTANT - Try to reduce victim's body temperature to normal. Sponge with water, keep in shade, etc.
- Arrange immediate transportation to medical facilities

Note that one of the keys to diagnosis and treatment is knowing body temperature. A medical thermometer is a handy thing for the Team CO or Medic to have along. Since temperatures may reach well above the thermometer range in a pack or kit, the thermometer should be carried in a shirt pocket (in a pocket case).

2.3.4 BITES

Ranger activities expose the participants to all types of bites. Insect bites are the most common, although snake and animal bites are sometimes encountered during field operations.

Snake-bite

Bites inflicted by non-poisonous snakes are treated in a manner similar to any puncture wound. Although such bites can be serious from the standpoint of infection, the immediate concern here is with snake-bites of the poisonous variety.

Prevention of snakebite requires a certain measure of vigilance on your part: watch where you place your hands and feet, and where you sit or lie down. Be especially cautious around rock ledges and fallen logs. Check your sleeping bag before crawling in. Wear high boots. Learn to recognize the poisonous variety of snakes, but don't "fool around" with any kind of snake.

Symptoms. Strange as it may seem, the occurrence of a snake bite is not always recognized immediately as such, unless the victim actually saw the snake inflict the wound. But the symptoms that follow the bite of a poisonous snake are usually unmistakable: continuous pain and swelling about the bite area, and--in the case of pit vipers--the telltale fang marks consisting of one or two punctures. The victim will probably become quite weak, with accompanying shortness of breath and weak but rapid pulse. Nausea and vomiting usually follow a bite, and sometimes the impairment of vision or even unconsciousness follow.

Treatment. With respect to poisonous snakebite, AFM 64-5 suggests the following: "If you get bitten, immediately apply a (constricting band) between the snakebite and the heart. Then make a cross-shaped cut about one-quarter inch deep through the fang marks and

immediately apply suction over the bite--suck over a piece of rubber tissue, if available, or directly by mouth if there are no open sores in the mouth, and spit out poison immediately. Release (constructing band) every 20 minutes for periods of 30 seconds. After a few hours (three or four), release the (constricting band) for increasing periods of time."

To this, we can only add the following: Don't panic. Require the stricken person to lie down, and forbid any muscular exertion on his part. Reassure him that everything will be all right. Keep the bitten part lower than the rest of his body. Keep in mind that the constriction-band is NOT A TOURNIQUET; it should NOT restrict the flow of blood through the arteries or major veins. Do NOT administer stimulants. Avoid unnecessary "slashing," as serious damage to underlying muscles or nerves might result. The main cut should be longitudinal, since that is the direction in which most muscle tissue and nerves pass. Finally, be alert for symptoms of shock, and transport the bitten individual to a doctor (or to a hospital) without delay.

Concerning the application of the mouth for suction: snake venum is not poisonous when ingested. However, if the person applying suction has sores in his mouth, he might admit small amounts of the poison into his bloodstream, with minor local effects. In any case, it is usually a good idea to rinse the venum out frequently with fresh water.

Remember, most healthy adults that are bitten on an arm or leg by a poisonous snake in this country survive even without treatment. The important thing is to KEEP THE VICTIM CALM and DO NOT LET HIM EXERCISE. If you are by yourself and bitten, it may be better to camp on the spot rather than try to walk out. Apply the appropriate first aid, and then relax (as best as possible) and let help find you.

Animal Bites

Animal bites are rare on Ranger activities, and preventive measures are obvious: avoid all strange or wild animals, particularly those that are acting in a peculiar manner. Don't take chances, even with small and seemingly harmless rodents such as mice, chipmunks, or squirrels. Bites from warm-blooded animals, even though only apparently superficial, can result in rabies infection, if the animal is so afflicted. Tetanus, tularemia, and other infections can also be transmitted by animal bites or scratches.

Treatment. If you are bitten by an animal, cleanse the wound thoroughly and apply an antiseptic. This antiseptic will NOT combat rabies or tetanus infection, however! If possible, the animal should be kept under observation. In the case of non-domesticated animals, do not attempt to capture the animal alive, as further bites might result.

However, if the animal can be destroyed without risking further bites, save the carcass (in particular, the head) of the dead animal for laboratory experimentation. Since positive identification of rabies infection can be made from an examination of the brain, the very painful anti-rabies innoculation procedure can be avoided if the animal's carcass is recovered.

Rabies is a deadly disease and animal bites, even small ones, require immediate medical attention.

Insect Bites and Stings

Insect bites and stings can be considered dangerous from three standpoints: 1) some people are allergic to the secretions deposited by the insect; 2) infections may set in, due to repeated scratching and to high susceptibility of the person to the irritant injected by the insect; and 3) certain insects carry diseases which, in themselves, can be serious or even deadly.

The types of insects that create particular situations, and the treatments that apply to each, vary considerably. Bites, stings, and secretions of special interest include those inflicted by mosquitoes, ticks, fleas, leeches, spiders, scorpions, centipedes, chiggers, wasps, and wild bees. Since detailed discussion concerning treatment is offered in First Aid (American Red Cross Manual), AFM 64-5 (Survival, section entitled LAND SURVIVAL, subsection "Health and Hazards, Tropics"), and various camping books, the following will offer only some general hints concerning prevention of bites and stings.

Prevention. Protection from insect bites and stings can be obtained by wearing suitable clothing, by the use of insect repellent, and by being alert for insects in the "bee" category. If the insects are particularly annoying, wear gloves, protective netting (over the head and neck), and long-sleeved shirts, even in hot weather. Don't be afraid of being dubbed a "sissy" by following such measures: if your fellow Team members are woods-wise, they will be using the same tactics. Multiple insect bites are particularly annoying, and can easily distract a person to the point that he is useless as a searcher.

Proper site selection is often the answer to insect control, when the time comes to establish a camp. In addition to comments made in the Woodsmanship section concerning location of camp and proper waste-disposal measures, smudge-fires might be useful in warding off many winged insects. When in camp, be careful where you place your hands or where you sit. Shake out the sleeping bag before getting in, and shake out clothing and boots before putting them on. Avoid camping near or disturbing insect nests--ant colonies, bee-trees, wasp or hornet nests.

If possible, sleep off the ground in insect-infested territory (hammocks can be improvised for this purpose). Otherwise, sleep under a well-"sealed" shroud of mosquito netting. The inside of a well ventilated and netted shelter can be sprayed with insecticide to destroy any insects that might occupy the area sheltered; but make SURE that the fumes have dissipated before bedding down in that area.

2.3.5 IMMUNIZATION

Innoculations are presently available against many infections that a Ranger may encounter. The most important of these infections is tetanus. If you have not had a series of shots for tetanus, consult your doctor NOW. Note that this immunization must be kept current with booster shots approximately every two years.

Another possibility most people do not think of in this day of municipal water supplies is typhoid. Yet Rangers often drink from questionable water sources, and proper disinfecting procedures are often "forgotten." Consult your doctor for immunization against typhoid and any other diseases he recommends for your circumstances.

"An ounce of prevention is worth a pound of cure."

2.3.6 PERSONAL FIRST AID

Personal first aid, the applying of learned first aid techniques to yourself, is mostly a matter of common sense. Don't be lazy; do the job right. Here are a few reminders.

- Handle all dangerous equipment and situations with thought and care. (Preventive first aid.) Do not fool around, and use all safety precautions possible for the situation. Think before you act.
- Report all injuries to your Commander or Medical Officer for proper evaluation and treatment.
- Do not treat any injury lightly. Serious consequences can result from even the smallest injuries. (Example: tetanus from a barbed-wire fence scratch.)
- Clean and apply an antiseptic and dressing to all cuts, even the smallest.
- Keep yourself in good physical condition. Deleterious consequences of snakebites and many other maladies are most evident among the aged, the very young, and THE

INFIRM. Keeping in shape will minimize the danger of serious after-effects of many infections and illnesses.

- Know your first aid procedures thoroughly, for all types of injuries.

2.3.7 FIRST AID COURSES: AN OVERVIEW

Once again, it must be stressed that the main theme of this Medical Section has been to emphasize the preventive aspects of first aid and to cite some of the more common problems within a Ranger Team. Up to this point we have almost totally ignored the role of first aid in the RESCUE function of Civil Air Patrol Ranger Teams. Since we are often seeking the victim(s) of an airplane crash, who may well be suffering from multiple compound fractures, burns, exposure, shock, etc., this aspect of first aid is vital to the training of a Ranger Team. Since there are exceptionally good first aid courses readily available, a detailed discussion of those wounds that usually accompany a violent accident is beyond the scope of this training manual. HOWEVER, IT IS DEFINITELY WITHIN THE SCOPE OF THE RANGER TRAINING PROGRAM.

To become a Ranger First Class, you must have successfully completed the Red Cross Standard First Aid Course. To become an Expert Ranger, you must have successfully completed the Red Cross Advanced First Aid Course. To arrange for these courses, contact your nearest Red Cross office.

In addition, it is advisable to assign a few responsible Ranger Team members to enroll in an ambulance attendant course. These are often available through local ambulance services, fire companies, or the American Red Cross. It is also suggested that some of your Team personnel qualify for an Instructor's rating from the Red Cross to insure a high quality of first aid as well as a ready supply of instructors for your new members.

SECTION 2.4
SURVIVAL TECHNIQUES

While the objectives of the Ranger Team are search and rescue, primarily of personnel in downed planes, and secondarily of people who may have become lost in the woods, there may be occasions when a Ranger becomes a victim rather than the searcher. Should he have strayed from his Team and become temporarily lost, the procedures described in 2.1.5 (When Lost: An Introduction to Survival) are applicable. However, should he find himself in an aircraft that has been forced down, either while participating in a search mission or on a flight not connected with C.A.P. operations, there are many wild, remote areas remaining in this United States and Canada where survival could well be a problem.

In the context of this manual, survival techniques will relate to the act of staying alive, in reasonably good health, and effecting a return to civilization in the event of an accident (air or otherwise) or when one or more people become lost in the wilds of this northern hemisphere. The worst conditions apply in the winter under arctic conditions, while somewhat less formidable circumstances prevail in other seasons and when closer to habitation. Nevertheless, the basic principles remain the same: only the degree of severity varies.

This manual can only introduce the topic of SURVIVAL, since the subject, in its entirety, is enormous. Were this manual to be all-inclusive, it would necessarily cover survival on land, sea, and sea ice, in addition to the topics of food, shelter, clothing, fire making, survival weapons, orientation, traveling, signaling, survival swimming, seamanship, and several others. Excellent references are provided, and the inexperienced Ranger is especially urged to read further in AFM 64-5 and the other references.

2.4.1 PSYCHOLOGY AND IMMEDIATE ACTION

Imagine that you find yourself lost or downed in the wilderness, and that you are either alone or with a small group. In such a situation, you should immediately sit down and commune with yourself (or discuss with the group) the fact that, although you are lost, this is but a temporary setback, since you have been prepared through training to cope with such a crisis. Your excellent physical condition is a source of reassurance, and you have faith in your ability to survive, as a result of your knowledge of fire and shelter building, food procurement, first aid, signaling, and - if the need arises - traveling.

However, there is in every lost person a certain brief period when fright arises as a result of the sudden realization that he is LOST and in trouble. The cardinal rule is: DO NOT PANIC. Keep calm and start analyzing the situation. Have faith in yourself to be able to confront and overcome the problems which lie ahead.

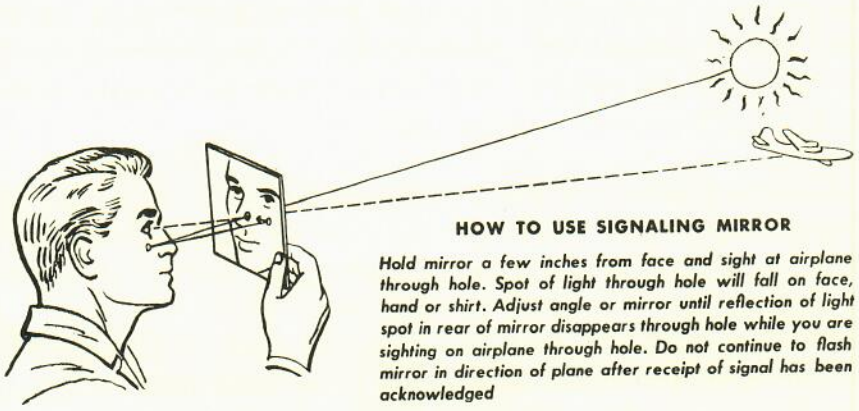
Under arctic conditions, in the absence of casualties, one must immediately provide shelter. If there are casualties, however, they must be treated and shelter provided AT THE SAME TIME, IF POSSIBLE, since time is of the utmost importance. Likewise, building a fire is important. Heat of any type is necessary, both as an ally against arctic conditions and as a morale stimulant.

Assume that rescue is not imminent, unless you have had an opportunity to radio your position, receive an answer, and confirm that your position is definitely established. Any errors in navigation can seriously hinder your chances of being rescued. Once casualties have been cared for, fear overcome, and shelter, warmth, and reassurance provided, the time has come to survey the situation carefully. If you are part of a group, it is in order to discuss with them the fact that you must use all of your experience and resourcefulness to get out alive. At this point, the immediate problems include making preparations for signaling help, and altering the natural appearance of the terrain to help make the location more visible to search aircraft. Finally, the decision must be made concerning whether to remain at that location or to travel.

Signaling. People have been missed by search aircraft, simply because they were not sufficiently prepared to start their fires, use their signals, or activate other means of attracting attention. If a radio is available, recognize that when an aircraft is in flight, a listening station will probably also be on the air. Thus, batteries can be conserved for the more probable periods of the day when help might be reached by radio. Do not attempt to use the radio unless the batteries are warm. Small batteries may be held against the body for warmth, while larger ones should be warmed by other available means. Although the batteries will be more effective when warm, one should take care to avoid overheating them. Of course, if a means of charging the batteries is available, make use of it.

Mirror Signaling. A good means of attracting attention during daylight hours involves the use of mirrors or mirror-like surfaces for reflecting flashes of sunlight to search aircraft. If it is not storming, and if the person is able to leave his shelter, he should flash the mirror, even on hazy days, since the flash of light might be spotted by the observer on the search aircraft, even though the plane may not be visible from the ground!

A frequent mistake in signaling procedure involves improper positioning of the mirror with respect to the sun. To overcome this error, all Rangers should practice the technique until it is mastered. "Targets" for such practice might be certain surrounding trees, rocks, or other objects.



HOW TO USE SIGNALING MIRROR

Hold mirror a few inches from face and sight at airplane through hole. Spot of light through hole will fall on face, hand or shirt. Adjust angle or mirror until reflection of light spot in rear of mirror disappears through hole while you are sighting on airplane through hole. Do not continue to flash mirror in direction of plane after receipt of signal has been acknowledged

MESSAGE RECEIVED AND UNDERSTOOD

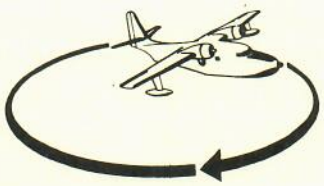
Aircraft will indicate that ground signals have been seen and understood by—

DAY OR MOONLIGHT: Rocking from side to side

NIGHT: Making green flashes with signal lamp

MESSAGE RECEIVED AND NOT UNDERSTOOD

Aircraft will indicate that ground signals have been seen but not understood by—



DAY OR MOONLIGHT: Making a complete right hand circle

NIGHT: Making red flashes with signal lamp

GROUND-AIR EMERGENCY CODE

1. Require doctor — serious injuries	*2. Require medical supplies*	*3. Unable to proceed*	*4. Require food and water*	*5. Require firearms and ammunition*	*6. Indicate direction & proceed*
7. Am proceeding in this direction	*8. Will attempt to take off*	*9. Aircraft badly damaged*	*10. Probably safe to land here*	*11. All well*	*12. Require fuel and oil*
13. No — negative	*14. Yes — affirmative*	*15. Not understood*	*16. Require engineer*	*17. Require compass & map*	*18. Require signal lamp*

If a "watch" has been posted, leave ths signal mirror with that individual, so that he can begin to reveal his position at the first sign of approaching help. If only one person is involved in the survival situation, the mirror can be suspended, when he is not on watch, in an appropriate place where it will swing with the wind, catching sunlight and reflecting it in all directions.

Flares. Flares must be used wisely: that is, with the aircraft coming towards you. Do not waste flares by firing after the aircraft has passed overhead, since the searchers in that aircraft are intent on their flight and on searching ahead, while looking back only on chance occasions. This fact adds a sense of urgency to the requirement of having all in readiness for signaling, and of maintaining a watch.

Fixed Signals. The following are excerpts from AFM 64-5:

"Signal with a flashlight or the blinker signaling light of the emergency radio. If the airplane landing lights are intact and you can get an engine to run, remove the lights and extend them for signaling. But do not waste the battery - save it for the radio.

"Place or wave the yellow and blue cloth signal panel in the open where it can be seen. Spread out parachutes. Make a pattern of orange-colored Mae Wests. Line up cowl panels from engine nacelles upside down on airplane wings or ground; polish the inside surfaces - they make good reflectors. Arrange your ground signals in big geometric patterns rather than at random - they will attract attention that way. The radio balloon or kite makes a good signal. Use the fluorescent dye available in the life raft or Mae West kit for signaling on water or snow. Use it carefully, for a little goes a long way; use it only downwind, for the fine dye will penetrate clothing or food. On rivers, throw it out into the current for a quick spread. If you can climb a tall tree, hoist a large white or colored improvised flag on a pole lashed to the top.

"Do everything you can to disturb the "natural" look of the ground. If you are down in grass and scrub lands, cut giant markers - an 8 to 12 foot wide circular path, 60-75 feet in diameter, is easily seen from the air. A trampled or burned grass pattern will show from the air. In winter, tramp out signals in the snow. Fill them in with boughs, sod, moss, or fluorescent dye water."

2.4.2 THE BIG DECISION: TO STAY OR TO TRAVEL

After the above emergency measures have been completed, it is necessary to decide whether to stay put or to attempt to travel to habitation. This decision is a weighty one, and hence must not be made in haste. Generally, the decision to remain has much merit, for the following reasons:

- The downed aircraft, if there is one, offers shelter, fuel, and possibly tools;

- The aircraft itself is probably a very visible object, the type for which search parties naturally look;

- Single human beings in rugged terrain or forested areas are particularly difficult to spot. By remaining in one location, one can develop various means for being spotted from a search aircraft;

- Staying has special merit if there are casualties in the party, or if a member of the party might actually become a casualty in an attempt to travel with unsuitable clothing, footgear or supplies. If at least one member cannot withstand the cold, he can be considered a potential casualty and may become such a burden that travel is retarded, anyway;

- Traveling requires much more food per man than immobility. Therefore, if there is a meagre supply of food, it can be conserved by staying rather than traveling;

- As a general rule, AFM 64-5 recommends that an individual should not travel unless he is reasonably certain of his position and knows that habitation can be reached with available equipment.

Staying at the Crash Site. If the decision is made to stay at the crash site, then appropriate survival plans must be arranged.

1. Improve your hastily-made shelter, using the airplane itself, parachute material, material from the wooded areas, or even snow. Here is where you will put into serious practice the lessons learned through the Ranger Training Program (in particular, many woodsmanship skills). Under conditions of intense cold, shelters should be constructed in such a way that the body heat alone brings the temperature up to at least 30°F. In the arctic, this is real warmth and comfort. Under such extreme circumstances, a wind-proof shelter is essential.

2. Investigate your fuel supply and arrange to have an abundant supply always available and protected, in case of sudden storms or for signaling purposes. In wooded areas, this may not appear to be a problem; however, you will soon discover that maintaining a fire can become a bigger problem than starting it. You are advised to arrange shelters to shield from the wind, and thus conserve on needed fuel. From the standpoint of fuel, water or food procurement, it might be desirable to move from the crash site for a short distance.

If prepared fuel is used (such as in primus stoves, or fuel that has been taken from the aircraft or vehicle), conservation of this fuel is of the utmost importance. Your whole ability to survive may rest upon how well this fuel is conserved.

3. Appoint a leader and establish job assignments. The individual in charge must be the most knowledgeable, non-injured member of the group. If the original leader is a casualty, it is advisable that he appoint a person to take charge, while he (the former leader) acts as advisor.

Chores must be divided such that no individual feels that he is doing more than another. Under survival conditions, perhaps more than any other time, it is highly desirable to achieve harmony and cooperation (rather than conflict) among the members of the group. An unfair allocation of tasks hardly contributes to such feelings of unity, and hence should be avoided. Further, increased tensions normally experienced by a person under survival circumstances can easily become a stimulus to quarreling, even over seemingly trivial incidents. For these reasons, among others, it is a good policy to share tasks equally, so that each person has his turn to cook, chop wood, get water, or stand watch.

The Decision to Travel. If the decision has been made to travel out to habitation, it is because you know your location and the approximate route out, and there are good indications that no searching party is out looking for you. In the arctic under conditions of deep snow, travel is an impossible task, unless you know how to construct snowshoes or skis. Much energy will be expended for the relatively little distance gained, as you repeatedly sink into the deep snow. Further, travel time (with snow obstacles) will likely be much slower than you would expect, and, since the going will be exceedingly strenuous, the dangers of perspiration and consequent chilling are ever present.

Later in the season, when the weather becomes warmer, there are additional handicaps, either in plowing through the soft, wet snow or in attempting to travel on the waterways. The latter become treacherous, especially if the water is flowing, and one might well break through the ice and come to a real catastrophy. One can partially minimize the danger of traveling on ice by pretesting it frequently with a long, stout staff. In crossing an ice-covered body of water, a long staff serves the additional function of enabling you to get out, or at least to stay at the surface of the water, in the (disastrous!) event that you break through the ice. Your weight will be distributed across the length of the staff, and hence you stand a better chance of being supported by the thin ice surrounding the break-through point. Of course, a speedy retrieval from icy water and the immediate provision of warmth to the victim of such an accident is ESSENTIAL to his survival.

In traveling, if travel you must, leave a conspicuous note at the crash site stating your plans, then decide how far you will go for that day. Do not be over-ambitious and try to cover ground fast. Travel at a moderate pace to avoid excessive perspiration. Rest frequently. Stop two hours before dusk to permit ample time to arrange a proper camp and dry out clothing. (Review the remarks in Section 2.1, "Winter Camping Conditions"). Check each other (or yourself) for indications of frostbite, including the feet. Use your knowledge gained in the Ranger Training Program to establish the correct direction of travel and to maintain it throughout the day.

If you should be so unfortunate as to be downed in the arctic without goggles, do not attempt to travel until a substitute has been made. Goggles can be constructed of board, cardboard, or cloth by making small peek-holes (or slits) in the material, and then fitting the improvised goggles over your eyes, with suitable means for fastening. In the case of board or cardboard, or in case the goggles do not have adequate side protection, provide a piece of cloth at the sides so that glare will not come in from that direction.

Symptoms of snow-blindness include itching and burning of the eyes, or restricted vision upon entering a darker area. When these indications of snow-blindness appear, the time has come to take remedial action. Treat by protecting the eyes from light and relieving the pain. Relieve the pain by putting cold compresses on the eyes, if there is no danger of freezing, and by taking aspirin. Most cases will recover within 18 hours.

2.4.3 FOOD PROCUREMENT

A person facing survival conditions should inventory his food supply and ration it accordingly. Keep in mind that the body of an active person requires more food than that of a sedentary one. Therefore, persons assigned to travel in search of help should be given about twice as much food as those who remain with the downed aircraft. Similarly, individuals engaged in hunting, food, or fuel procurement need more food to sustain their level of activity than an injured person who cannot participate in such strenuous activities.

Meals should be taken on a <u>regular</u> basis. One should avoid the temptation to "nibble" at the rations. Eat at least one full meal per day (although two are preferable). Hot meals are especially desirable, since cooking makes food safer, more digestable, and more palatable. Cooking has the added benefit of providing a rest period. The Air Force advises survivors to estimate the number of days that they expect to be stranded, then to divide available food into thirds. Allow two-thirds of the food to be consumed during the first <u>half</u> of the estimated time before rescue, and save the remaining one-third for the second half.

Water is crucial to survival. If one has less than a quart of water available per day, he should avoid dry, starchy, and highly flavored foods and meat. The best foods to eat under these circumstances are those with high carbohydrate content, such as hard candy and fruit bars. If water is abundant, drink more than usual... especially when food is scarce. One can live many days without food, when water is available in abundance.

The following types of foods meet most bodily requirements (abstracted from AFM 64-5):

"Carbohydrates. Mostly plant in origin - sugar, starches, cereals, and fruits. If your water supply is severely restricted, stick to these foods.

"Proteins. Mostly animal in origin - meat, fish, eggs, milk, and cheese. Proteins are valuable fuels but their real importance is in maintaining and repairing body tissues. When you eat more of them than you need for maintenance, the extra amount is burned as fuel or converted to storage fat and carbohydrate. Your daily need is 3 ounces under all conditions; hard work does not require more. If your water supply is limited, do not eat large amounts of protein.

"Fats. Partly plant - olive and cottonseed oil; partly animal - butter and lard. Except in very small amounts, fats are not essential for human nutrition. Although inefficient in comparison, fats provide more than twice as many calories per unit weight than do proteins or carbohydrates. Diets very high in fat cause digestive disturbances and often produce an acid condition (ketosis) that requires added water intake for elimination."

Concerning wild foods, finding foods in general, and animal food, AFM 64-5 advises us further:

"Learn to overcome your prejudices. Foods that may not look good to eat are often part of the native's regular diet. Wild foods are good foods, with high vitamin and mineral content. Fleshy-leaved plants make good salad greens; and fresh fruits provide fluid when water supplies are low. Eat enough to satisfy.

"With a few exceptions, all animals are edible when freshly killed. Don't eat toads. Never risk your life with questionable sea food. Never eat fish with slimy gills, sunken eyes, flabby flesh or skin, or an unpleasant odor. If the flesh remains dented when you press your thumb against it, the fish is probably stale. For poisonous and venomous fish, as well as for poisonous plants and mushrooms, consult other parts of this manual (AFM 64-5).

"Where to Look. You should be able to find something to eat wherever you are. One of the best hunting grounds for survival food is along the sea coast, between the high and low water mark. Other likely spots are the area between the beach and a coral reef; the marshes, mud flats, or mangrove swamps where a river flows into the ocean or into a larger river; river banks, inland water holes, shores of ponds and lakes; margins of forests, natural meadows, protected mountain slopes, abandoned cultivated fields. Poorest hunting grounds are high mountain tops, dry ridges, and dense, continuous forest stands.

"Animal Foods. Animal food will give you the most food value per pound. Anything that creeps, crawls, swims, or flies is a possible source of food. People eat grasshoppers, hairless caterpillars, wood-boring beetle larvae and pupae, ant eggs, and termites. Such insects are high in fat. You have probably eaten insects as contaminants in flour, corn meal, rice, beans, fruits, and greens of your daily food, and in stores in general."

Whenever possible, augment the food supply with game, fish, and edible plants. If water is nearby, it is probable that fish can be caught. The following fishing hints are taken from AFM 64-5:

"Fishing Hints. A simple way to catch fish is with a hook and line in your emergency kit. Use insects, shellfish, worms, or meat for bait. Try to see what the fish are eating. Artificial lures can be made from pieces of brightly colored cloth, feathers, or bits of bright metal. A length of wire between the line and hook will prevent a fish from biting the line in two. If you have no hooks, improvise them from wire or insignia pins, or carve them out of bone or hard weed. You can make a line by unraveling a parachute shroud line or by twisting threads from cloth or plant fibers. If the fish won't take bait, try to hook them in the stomach as they swim by.

"Better and more efficient than a line is a net. If you have a seine, attach poles at each end and work it up or down stream as rapidly as possible, moving stones and threshing the bottom or edges of the stream banks. Gather up the net quickly every few moments so the fish will not escape. If you have a gill net, use it in absolutely quiet water of lakes or streams; stones may be used as anchors and wood for floats; set the gill net at right angles to shore. It will occasionally catch diving birds which try to rob your gill net."

Detailed instructions for making gill nets, seines, and other fish traps can be found in AFM 64-5. When reading those sections, one should pay careful attention to where and when such devices are used to best advantage.

Some fresh water streams too small to hold much in the way of fish life may nevertheless harbor various crustacea - in particular, the crayfish ("craw-dads") - under rocks and dead leaves. Crayfish are especially easy to catch at night, in still pools or in a slow-moving current, with the aid of a flashlight. To prepare crayfish, drop the live ones into boiling water and cook for several minutes. The tails of cray - fish are every bit as tasty as shrimp, although you may need quite a few to make a decent meal. Aquatic snails and freshwater shellfish are also edible, when properly prepared.

Finding Bait. It isn't likely that you will have a shovel to dig worms, or a minnow seine to catch minnows for bait, when thrust into survival circumstances. But, as we shall see, such devices are seldom necessary; plenty of bait can be collected by an observant and imaginative person with two hands, a knife, and - occasionally - a flashlight.

Worms can usually be found under damp, matted leaves or under rocks and logs, in moist terrain. In addition, damp or rainy weather brings worms and nightcrawlers to the surface after dark. A flashlight and a bit of agility are all that's necessary to furnish a large quantity of bait. But... conserve those batteries!

Rotten logs can also be torn apart for grubworms and other insects. Grasshoppers are often found in grassy fields; search for them in early morning, while dew is still on the grass. During this time of day, they are quite sluggish and easily captured. Crickets are also a good bait, especially for panfish and trout. Rocks near and in streams often hide various forms of insect life in larval and pupae stages. These "nymphs" are the mainstay of most stream-dwelling fish; hence, they should not be passed up as a possible bait. Small frogs and salamanders are also excellent bait for larger fish, such as bass and pike.

Special Considerations. Most wilderness fish will be wary in the presence of strange creatures (including man). Consequently, approach the fishing task with the stealth of a game-stalker. Keep low when approaching a pool, and - if possible - approach it from the down-stream side (since fish will be facing into the current, in most cases). While wilderness fish may not be particularly choosy about the appearance of the bait that you present, any unnatural disturbances will definitely detract from your chances of making a catch.

In short: try to learn the spots which fish typically occupy in streams, and be extremely cautious in your approach. Study water currents to make sure that your bait will reach the spot - in a natural way - where you expect fish to be. These simple precautions will be a better guarantee of fishing success than access to the most sophisticated fishing apparatus available in any sporting goods store.

Hunting Tips. Depending upon the type of terrain you are in, game offers means of augmenting rations. Since game is usually relatively scarce, the survivor must be especially alert and watchful for signs indicating the presence of game. Unfortunately, many people today are far-removed from an intimate familiarity with the wilderness and its life forms. Hence, the survival of all members of the stranded group might well depend solely upon the diligence which you applied to your survival training as a Ranger in Civil Air Patrol.

Some helpful hunting hints from AFM 64-5 are reproduced here, for your benefit. Further reference to BSH might be made to gain additional information concerning animal tracking, habitat, and the like.

"Most warm-blooded, hairy animals are wary and hard to catch. To hunt them requires skill and patience. The best method for a beginner is "still hunting." Find a place where animals pass - a trail, watering place, or feeding ground. Hide nearby, always downwind so the animal can't smell you, and wait for game to come within range. Remain absolutely motionless. You can stalk an animal upwind by moving very slowly and noiselessly, keeping under cover as much as possible. Move only when the animal is feeding or looking the other way. Freeze when he looks your way.

"The best time to hunt is in the very early morning or dusk. In your travels, keep alert for animal signs such as tracks, trampled underbrush, or droppings. On narrow trails be ready for game using same pathways.

"Game is most plentiful and easiest found near water, in forest clearings, or along the edge of thickets. Many animals live in holes in the ground or in hollow trees. Poke a flexible stick into the hole to determine if it is inhabited. Use a stick to tease the animal into running out, but first close off other exits. Animals in hollow trees can be smoked out by a fire built at the base of the tree; be ready to club the animal as it comes out.

"Night hunting or fishing is always good, since most animals move at night. Use a flashlight or make a torch to shine in the animal's eyes. They will be partly blinded by the light and you can get much closer than in the daytime. If you have no gun, try to kill the animal with a club or sharpened stick used as a spear. Eyes of spiders and insects are good reflectors, so don't be surprised if you "shine up" eyes and can't find the rest of the creature. Eyes of spiny lobsters on reefs shine red. Remember that large animals when wounded or with their young can be dangerous. Be sure that the animal is dead.

"Along river and lake shores, small, fresh-water turtles can often be found sunning themselves. If they dash into shallow water, you can

still get them. Watch out for mouth and claws. Frogs and snakes also sun and feed along streams. Use two hands to catch a frog - one to attract it and keep it busy while you grab it with the other. All snakes, except sea snakes, are good to eat; use a long forked stick to catch them.

"Both marine and dry-land lizards are edible. Use a baited noose or a fine fish-hook baited with a bright cloth lure, or use a slingshot or club.

"Never overlook small birds and their nests. All bird eggs are edible when fresh, even with embryos. Large wading birds, such as cranes and herons, often nest in mangrove rookeries or in high trees near water. Ducks, geese, and swans are to be expected in tundra areas. During the moulting season these birds can be clubbed. Sea birds along low coastlines frequently nest on sand bars or low sand island. Steep, rocky coasts are favorite rookeries for gulls, auks, murres, and cormorants. Catch your birds at night when they are roosting."

Traps and Snares. When an extended stay is expected, snares and traps can be particularly useful in food procurement. All Rangers must be familiar with the setting of traps and snares; however, they are cautioned that, except under survival conditions, the setting and leaving of traps and snares is probably illegal in their state. Traps should be constructed only for demonstration purposes and taken down immediately. Consult AFM 64-5, BSH, and other sources for descriptions, construction diagrams, and helpful information concerning placement of these devices.

Plant Foods. The subject of plant foods is beyond the scope of this manual, and the Ranger is referred to AFM 64-5. The list of available edible foods is enormous, with but a relatively small number of these plants in the poisonous category. However small this latter list, though, it is important that precautions are taken. The following guidelines are abstracted from AFM 64-5:

"Edibility Rules. Never eat large quantities of a strange food without first testing it. Prepare a cooked sample, then take a mouthful, chew it, and hold it in your mouth for five minutes. If it still tastes good, go ahead and eat it. If it tastes disagreeable, don't eat it. Remember that olives are bitter and grapefruit is sour, so an unpleasant taste does not, in itself, necessarily mean poison. But a burning, nauseating, or bitter taste is a warning of danger. A small quantity of even poisonous food is not likely to prove fatal or even dangerous, whereas a large quantity may be. (WARNING: THIS COMMENT DOES NOT APPLY TO MUSHROOMS! SEE AFM 64-5 FOR COMPLETE DETAILS CONCERNING MUSHROOMS).

"In general, it is safe to try foods that you observe being eaten by birds and mammals, but there are some exceptions. Food eaten by rodents (mice, rats, rabbits, beavers, squirrels, muskrats) or by monkeys, baboons, bears, racoons, and various other omnivorous animals (vegetable-eaters) usually will be safe for you to try.

"Precautions, Cook all plant foods when in doubt about their edibility. (Once again, note that mushrooms are an extremely important EXCEPTION).

"Except for mushrooms, poisons are removed by cooking. Most kinds of wild taro root, for instance, are poisonous when fresh, but after cooking are perfectly safe. Use these hints as a guide:

- Avoid eating untested plants with milky juice or letting the milk contact your skin (except the numerous kinds of wild figs, breadfruit and papaya, which are safe despite the milky juice).
- Avoid eating plants that taste disagreeable (bitterness is a guide).
- To avoid poisoning from infected heads of cereals or grasses (ergot poisoning), discard all grain heads having black spurs in place of normal seed grains."

2.4.4 FOOD PREPARATION

Air Force Manual 64-5 is once again our source for information concerning the preparation of animal and plant foods.

"Animal Foods

"Butchering and skinning. Skin large game; bleed and gut all animals. You can drink small amounts of blood but you should throw away the viscera. Use care in removing gall and urine bladders; if they are broken, the meat will be tainted. Washing will help clean your meat.

"Carefully remove all musk glands. Badgers, civets, skunks, minks, and otter have anal glands. Deer have musk glands on their feet; musk deer have them in the skin of their bellies. Most of the objectionable odor of small rodents will be removed by skinning.

"Bleed and draw all birds; skin the larger ones. Carrion-eating birds, such as vultures, have flesh unpleasant to the taste. Fish-eating birds have a strong, fish-oil flavor.

"Best meat on a lizard is hind quarters and tail. Eat the legs of a frog. Turtles have flesh on legs, neck, and tail, and tucked away between their shells.

"Skin all frogs and snakes. Remove and discard skin, head, and viscera.

"Cleaning shell food. Clams, oysters, mussels, crabs, and lobsters left in clean water overnight will clean themselves and save you the work. Note warning about mussels elsewhere in this manual (AFM 64-5).

"Cleaning and scaling fish. Immediately after you land a fish, bleed it by cutting out the gills and large blood vessels that lie next to the backbone. Scale and wash the fish in clean water.

"Small fish of the herring family can be eaten with a minimum of cleaning. Their scales are loose and drop off or can be washed off immediately after they are caught; the stomach and intestines can be flipped out with the thumb. These fish are oily, highly nutritious, and good - even raw.

"Cooking. Cooking makes for a more enjoyable meal. All wild game, fresh water fish, clams, mussels, snails, and crawfish must be thoroughly cooked for safety. Mince tough mussels or large snails. Never eat raw or smoked fresh water fish; they are frequently contaminated with tapeworm and lung fluke parasites. Parrots, hawks, and crows can be tough, but they will soften up when stewed. Plant foods are made more digestible and palatable and yield more food value after heating.

"Salt water shellfish may be eaten raw but are safest when cooked.

"Shark meat is edible except in the Arctic, but it must first be cut into small pieces and soaked overnight or boiled in several changes of water to get rid of the ammonia flavor which accumulates in the flesh. Shark meat is not poisonous, just unpalatable.

"Turtle eggs can be boiled or roasted, but the whites will not harden.

"Plant Foods

"Ordinarily, water used to boil plant roots, tubers, or seeds can be used to make a good broth with the addition of sea food or meat. In the tropics, some tubers, such as taro and manioc, must be soaked or boiled in water to remove harmful substances; afterward the water cannot be used for broth.

"To give taste to stews, add wild onions, puffballs, morels, succulent stems, and leaves of plants.

"To prepare seaweed for food, wash it in water, dry in sun on wood or stone platform, pound, and sprinkle over food.

"Boiling, roasting, baking, and frying - in that order of preference - are efficient ways of preparing foods. Pit cooking or clambake style (oven) is slower but takes less attention, protects food from flies and other pests, and reveals no flame at night.

"Fruits. Succulent fruits are best boiled. Large, tough, or heavy skinned fruits are best baked or roasted.

"Potherbs (Greens). Boil leaves, stems, and buds until tender. Several changes of water with subsequent rinsing will help eliminate bitter juices or undesirable tastes.

"Roots and tubers. These can be boiled but are more easily baked or roasted.

"Nuts. Most nuts can be eaten raw, but some such as acorns are better cooked. Acorns should be broken up, boiled with ashes from the fire to eliminate tannin, moulded into cakes, and then baked.

"Grains and seeds. Parch (roast) grains and seeds to make them more digestible and tasty.

"Sap. The sap of plants containing sugar can be dehydrated to a syrup by boiling slowly for several hours to remove the water.

"Mushrooms. Thin, tender, juicy ones can be stewed slowly in 5-10 minutes. Thick, dry, tough caps and stems will require 30-40 minutes of stewing or may be fried crisp. Fresh caps may be broiled or baked on hot stones or on a greased iron, 2-4 minutes for a side.

"Worms attack mushrooms and other edible fungi. Soak what you have picked in salt water for several hours and worms will rise to surface. Worms usually do not enter very young mushrooms.

2.4.5 WATER

"General

"Water will be one of your first and most important needs. Start looking for it immediately. You can get along for weeks without food, but you can't live long without water, especially in hot areas where you lose large quantities of water through sweating.

"Even in cold areas your body needs 2 quarts of water a day to maintain efficiency. Any lower intake results in loss of efficiency. If you

delay drinking, you will have to make it up later on."

To illustrate the importance of water procurement to survival, the following table is reproduced from AFM 64-5. Keep in mind that the chart illustrates the expected survival rates for desert conditions, which are certainly more demanding than any other situation, in terms of the individual's water needs. With this qualification, note that a person who has but one quart of water at the outset, who walks only at night when the temperature is lowest, and who can't replenish his water supply, is not expected to live more than five or six days in an area that attains a maximum daily temperature of 90 degrees.

DAYS OF EXPECTED SURVIVAL IN THE DESERT

UNDER TWO CONDITIONS

Condition	Max daily shade Temp °F	Available water per man, U. S. quarts					
		0	1	2	4	10	20
No walking at all	120	2	2	2	2.5	3	4.5
	110	3	3	3.5	4	5	7
	100	5	5.5	6	7	9.5	13.5
	90	7	8	9	10.5	15	23
	80	9	10	11	13	19	29
	70	10	11	12	14	20.5	32
	60	10	11	12	14	21	32
	50	10	11	12	14.5	21	32
Walking at night until exhausted and resting thereafter	120	1	2	2	2.5	3	
	110	2	2	2.5	3	3.5	
	100	3	3.5	3.5	4.5	5.5	
	90	5	5.5	5.5	6.5	8	
	80	7	7.5	8	9.5	11.5	
	70	7.5	8	9	10.5	13.5	
	60	8	8.5	9	11	14	
	50	8	8.5	9	11	14	

"NOTE: This Table 17B, p. 279, Physiology of Man in the Desert, by E. F. Adolph and associates, New York - London: Interscience Publishers, 1947. Survival time is not appreciably increased until available water is about four quarts, the amount necessary to maintain water balance for one day at high temperatures. Utilization of shade or saving a few degrees of temperature is as effective and as important in increasing survival time as water.

"Water needs in the jungle are much less than in the desert. At equal temperatures the body requires two to three times as much water

to maintain water balance in deserts as it does in jungles.

"Purify all water before drinking, either (1) by boiling for at least one minute; or (2) by using the water purification tablets in your first aid kit according to instructions; or (3) by adding 8 drops of 2-1/2% solution of iodine to a quart (canteenful) of water and letting it stand for 10 minutes before drinking. Rainwater collected directly in clean containers or in plants is generally safe to drink without purifying.

"Don't drink urine or sea water - the salt content is too high.

"Ground Water

"When no surface water is available, you may want to tap the earth's supply of ground water - rain or snow that has sunk into the earth instead of remaining on the surface to run off in streams and rivers. It sinks deep, leaving a thickness of dryer earth above.

"Access to this water supply depends upon the kind of ground - whether it is rock or some loose material like clay, gravel, or sand.

"Rock. In rocky ground, look for springs and seepages. Limestones and lavas have more and larger springs than any other rocks. Springs of cold water are safest; warm water has been recently at the surface and is more likely to be polluted.

"Limestones are soluble; and ground water etches out caverns in them - some large enough for you to explore and many just cracks, an inch or so high, that the water has enlarged. Look in these caverns, large and small, for springs. If you go into a large one beyond sight of the entrance, be careful - don't get lost.

"Most lava rocks contain millions of bubble-holes; ground water may seep through them. Look for springs along the walls of valleys that cross the lava flow. Some flows have no bubbles but do have "organ pipe" joints - vertical cracks that part the rocks into columns a foot or more thick and 20 feet or more high. At the foot of these joints you may find water creeping out as seepage or pouring out in springs.

"Look for seepage where a dry canyon cuts through a layer of porous sandstone.

"Most common rocks, like granite, contain water only in irregular cracks. Look over the hillsides to see where the grass is lush and green. Then dig your ditch just at the base of the green zone and wait for water to seep into it.

"Loose ground. Water is more abundant and easier to find in loose sediments than in rocks. Look for springs along valley floors or down along their sloping sides. The flat benches or terraces of land above river valleys usually yield springs or seepages along their bases even when the stream is dry.

"Don't try to find water with a switch or a forked twig; and don't waste your time digging for water unless you have some sign that water is there. Dig in the floor of a valley under a steep slope, especially if the bluff is cut in a terrace; or dig out a lush green spot where a spring has been during the wet season.

"Water moves slowly through clay, but many clays contain strips of sand which may yield springs. Look for a wet place on the surface of a clay bluff and try digging it out. Try wet spots at the foot of the bluff.

"Along coasts you may find water in the dunes above the beach or even in the beach itself, well back from the high-tide line. Look in the hollows between sand dunes for visible water - or dig if the sand seems moist.

"Arctic

"In the winter, ice and snow provide water but fuel is needed to melt them. Never waste fuel in melting snow or ice when drinkable water from other sources is available. In the summer there is plenty of water in lakes, streams, and ponds. Surface water on the tundra may have a brownish color, but it is drinkable.

"Whenever possible, melt ice for water rather than snow - you get more water for the volume with less heat and time. If you melt snow by heating, put in a little snow at a time and compress it - or the pot will burn. If water is available, put a little in the bottom of the pot and add snow gradually.

"If the sun is shining, you can melt snow on a dark tarpaulin, signal panel, flat rock, or any surface that will absorb the sun's heat. Arrange surface so that melt-water will drain into a hollow or container."

To conclude this section on water procurement, a discussion of the solar still is in order. This device is capable of providing a surprising amount of pure water from damp ground or sand, and is definitely worth trying when running water or purification techniques are not available.

To construct a solar still, Figure 2.4-1, first dig or gouge out a funnel-shaped hole in the ground, at least the size of a basketball. At

the very bottom of this hole, cut a little deeper into the soil to make room for a cup to catch the water. Next, place an oversized sheet of plastic loosely over the top of the hole, and weigh down the sides with rocks. One small rock is placed in the center of the plastic (immediately above the cup), and the weight of that stone causes the plastic to draw tight into the hole in a funnel-like fashion. Throughout the course of a day, much moisture is drawn from the ground and condenses on the stretched plastic. The condensation forms droplets, which run down the underside of the plastic funnel and into the cup. Barring any external contaminant (such as dirt dropping into the cup), water obtained in this manner is suitable for drinking without further treatment.

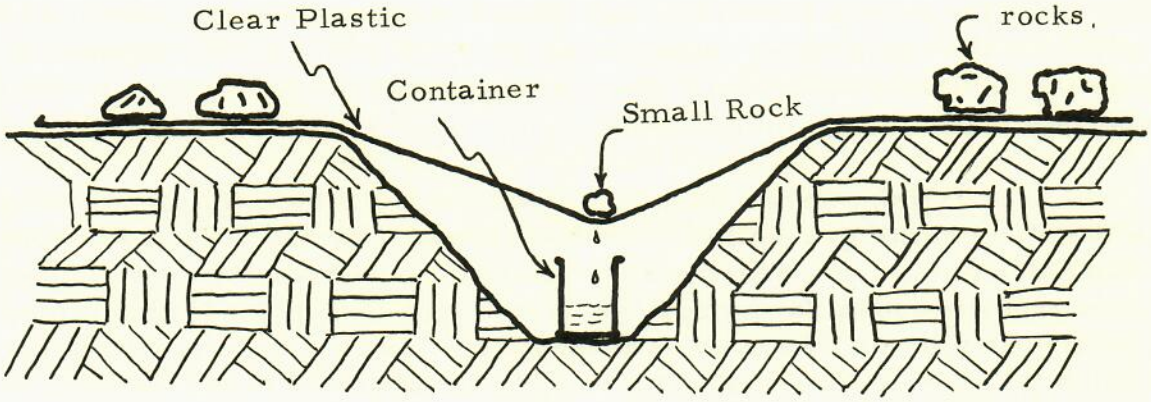


Figure 2.4-1. Solar Still.

2.4.6 GENERAL: CLOTHING, SHELTER, SELF-HELP

Man's ascendency in the animal kingdom is partly due to his ability to reason. Consequently, when survival is an issue, man must think his way through the dilemma. Take stock of <u>all</u> the assets, including the downed plane, any tools, clothing, fuel, or supplies, and utilize them for your benefit. Size up the problems. Is it Winter? Then freezing is perhaps the principal concern. In the Summer in the North country, flies and mosquitoes might constitute your main problem - except for the cold nights, which can certainly compound the difficulties of survival.

<u>Clothing</u>. It is <u>extremely</u> important to keep dry and warm. It has been stated previously (Woodsmanship, Section 2.1) that one should be especially alert not to perspire excessively. The consequences of violating this admonition may range from an uncomfortable chilling to a fatal freezing. Above all, when arctic conditions prevail, do not take chances with getting feet or clothes wet by accidentally slipping into water, unless you have a planned and immediate procedure for drying out.

It is possible to improvise certain elements of clothing, such as boots and headgear. For further details concerning such improvised apparel, consult AFM 64-5.

Shelters. Judgment is required in the matter of providing adequate shelter. If the decision was to "stay put," then one can afford time to provide more elaborate quarters, using all the ingenuity possible to make best use of available materials. If the decision was to travel, then you are advised not to expend all your energy in a "mad rush" to reach civilization. Rather, stop an hour or two early in the afternoon to provide adequate time for setting up camp, cooking, checking your feet, and providing time for drying out clothing. The shelters will necessarily be improvisations when traveling, and it is here that previous practice in selecting sites and utilizing available materials which will require the least expenditure of effort will be your biggest asset. Once again, woodsmanship skills merge imperceptibly with survival skills.

Self-Help. In Section 2.1.4 (Safety and Sanitation), the training is basically one of prevention of accidents and sickness. When a survival situation exists, the problems are the same as before; however, these same problems loom far more important under survival conditions, since you are completely "on your own" and most likely to be inadequately equipped, as well. You must "make do" with what you have! Resourcefulness, ingenuity, and good sense are invaluable assets in such times. So, you have no tablets along for purifying the drinking water? Good sense dictates that you drink from fresh, running streams or large lakes, rather than from a swamp. But, be forewarned: since there is usually reason to be suspicious of the water's purity, take time to boil it, if the resources are available. You cannot afford a case of diarrhea!

Even if utensils for boiling water cannot be fashioned from pieces of wreckage, bark containers can be constructed. The water is then brought to the boiling point by either dropping heated rocks into the filled container, or by putting the bark container directly over the coals. In the latter case, try not to have lively flames underneath, for while the bark below the waterline will not burn, the remainder of the container might. To demonstrate the point, try boiling water in a paper cup, over a candle. In the final analysis (with exception of sea and desert survival), the provision of pure drinking water will most likely hinge on your prowess as a fire-builder.

It is during a survival situation that all your training, experience, and physical fitness pay the biggest dividends. Let us hope, however, that you never need to apply them to this end.

SECTION 2.5
COMMUNICATIONS

This section will discuss the communications skills of the individual Rangers. See sections 3.5 and 3.8 for other phases of communications.

Communications is the very heart of teamwork. Sometimes two individuals can, with long practice, effectively cooperate to accomplish a joint task without exchanging a word. Such examples are rare, however, and the chances of this working with a large group are almost non-existent. Someone must communicate with the members of aTeam, telling each one what to do. In a like manner, Team members may pass information reports to their commander, multiplying his observation powers many-fold. Communications (and the teamwork derived from it) is what makes a collective search effort effective.

The individual Ranger should be practiced in the following five communication techniques:

1. Voice Commands
2. Hand Signals
3. Whistle Signals
4. Written Messages
5. Radio (Walkie Talkies)

the following sections cover these techniques.

2.5.1 VOICE COMMANDS

A drill team responds perfectly to a voice command by its leader. This command has two essential qualities:

- It can be heard by all members of the Team.
- Each member knows exactly what the command means.

Any voice command that fulfills these two criteria is a useful one. If either is lacking, confusion will result. The Chinese tactician, Sun Tzu Wü, observed as early as 500 BC that:

> "If the words of command are not clear and distinct, if orders are not thoroughly understood, then the general is to blame."

His advice holds true today.

Command Voice:

Against the day when he may be leading other Rangers, each individual should try to develop what is called a "Command Voice."

This is a way of speaking forcefully but clearly so that commands carry over large distances outdoors. This subject is treated extensively in the Drill and Ceremonies manual.

Clarity of Commands:

Each command must be carefully phrased so that only one meaning is possible. With simple facing and marching commands (see Drill and Ceremonies Manual) there is no problem, since every Ranger is familiar with these. A Ranger Team often meets circumstances, however, where a leader must invent a command on the spot. Consider the following command:

> "Team, halt. Rest in place. Smith and Jones, leave your packs here and go see if there is a road just over that ridge on our left. Be back here in five minutes."

Compare that with the following used in the same situation:

> "Hey, wait fellows. Is there a road over there? Smith and Jones, go take a look."

Notice that the second example left much to the imagination of several individuals:

- The Team members are unsure whether they are to stay halted until Smith and Jones return.
- Smith and Jones may have missed seeing where the leader pointed or was looking.
- Smith and Jones may not return for half an hour, being undecided how far they should go in search of the road.

Every time you hear a command given, analyze it to see if it is ambiguous. You would be surprised how many problems have been caused by unclear commands. Conversely, if you ever have a question as to the meaning of a command given you, ask for clarification. You may get a quick "chewing out" for being "stupid," but this is better than doing the job the wrong way. If you ask your question as clearly as the leader should have given his command, the chances are you will get a quick, courteous reply.

2.5.2 HAND SIGNALS

There are times when a Ranger Team in the field must be controlled by hand signals. This may be because the members are separated

too far for voice to carry, or because silence is necessary. There is a set of standard hand signals given in Appendix V. These signals must be memorized and practiced by all Rangers. Of course, to be effective, the Team members must watch the leader so as not to miss seeing the signals. (This is one example of keeping "lines of communication" open.)

2.5.3 WHISTLE SIGNALS

Whistle signals may also be used to control a Ranger Team in the field. These signals are especially effective when the team members are out of sight of each other, as in operating a skirmish line in a wooded area. The standard signals for Ranger Team use are:

1 long - Assemble
2 short - Halt
1 short - Resume Movement
3 short - "Heads Up," "Look Alert," or "Danger." This is also used as a distress signal if repeated.

These signals must be memorized by all Rangers.

2.5.4 WRITTEN MESSAGES

Occasionally it is necessary to communicate by using a messenger. In this case, giving him a written message to deliver eliminates the possibility of message distortion. The same principle of clarity in voice commands applies here. The message must be clear: no double meanings, nothing left to the imagination of the reader. Often such a message should be written out, carefully read, and then reworded and rewritten.

FM 21-75 (Combat Training of the Individual Soldier and Patrolling) has this to say about written messages:

> "A well-written message is clear, complete, and concise. A message is clear if it is easily read and understood. A complete message answers the questions of WHAT, WHEN, and WHERE. A message should be written in the briefest manner possible, omitting words which do not add meaning."

2.5.5 RADIO (WALKIE TALKIES)

The use of low powered (approximately 1/10 watt) walkie talkies on CAP frequency gives a Ranger Team tremendous communications potential within the Team. A scout can be sent out, report by radio, and

be redirected without returning to the Team. The Team can be divided, work separately with half a mile between, and still keep in touch. This is all made possible by the walkie talkie. No attempt will be made here to consider the use of radio between two Teams or between headquarters and a Team. That is covered in section 3.5. The discussion following is for the individual Ranger who may have to use a walkie talkie within his Team at any time.

Licenses:

First of all, any Ranger using any CAP radio should have a CAP Radio Operator's Proficiency Card and an FCC Restricted Radiotelephone Operator's Permit. As a part of fulfilling the CAP requirements, he must become familiar with the use of the phonetic alphabet and radio "pro words." These are listed in Appendix VI for handy reference. The walkie talkie will, of course, have a license and attendant call sign.

Equipment:

Walkie talkies are small, portable, battery operated, two way radios designed for Citizen's Band (CB) use. Their power output is usually about 100 milliwatts (1/10 watt) but may be anywhere from 30 milliwatts to 1-1/2 watts. Each radio consists of two main parts: a transmitter and a receiver. The power rating applies to the transmitter. A message is transmitted by pushing a "transmit" switch and talking into the microphone (which usually doubles as the speaker for the receiver). Receivers fall into two categories: Super Regenerative and Super Heterodyne. The Super Regenerative receiver is not selective enough for Ranger use; all Ranger Team walkie talkies should have Super Heterodyne receivers.

Frequency:

The frequency of the transmitter is controlled by a component called a crystal. For CAP use this should be 26.620 MHz. A Super Heterodyne receiver is also crystal controlled in frequency, but this crystal is usually 455 KHz different (either higher or lower) than the transmit frequency. Thus, the two crystal frequencies for a CAP walkie talkie should be (in most cases):

Transmit: 26.620 MHz Receive: 26.165 or 27.075 MHz

Since these walkie talkies are designed for common use on the Citizen's Band, it may be necessary to order special crystals for CAP use. This will cost extra money and time in most cases. It will pay to investigate the CB channel 10 crystals easily available for these units. CB channel 10 has a frequency of 27.075 MHz, and the transmit crystal

can be used as a receive crystal for CAP use. In many cases, the Channel 10 receive crystal will be 26.620 MHz and can be used as a CAP transmit crystal. (The radio receiver does not "care" if the receive crystal is higher or lower than the transmit crystal as long as the difference is the right size.)

Range:

The range of these walkie talkies varies with power and terrain. In a thick forest it may be no more than 1/4 to 1/2 mile between sets. On open ground it may range to 2 miles. To some extent, the radio waves follow a straight line-of-sight, so operating from high ground greatly increases effective range.

Batteries:

Batteries power all these units. The most common are size AA flashlight cells, usually either 6 or 8 of them. Some units use rechargeable batteries. One possible drawback to these is that they are usually designed for one day use with overnight recharging. Recharging is not always possible with a Ranger Team in the field.

To prevent corrosion damage to the radios, batteries must NEVER be stored inside radios between missions.

During cold weather, walkie talkies should be kept warm, since warm batteries are much more effective than cold batteries.

Antenna:

The antenna supplied with these units is usually a collapsing one. Two precautions must be taken with these. First, keep the antenna fully extended during use. The length of the antenna greatly affects its efficiency. Second, an extended antenna is easily broken while walking through woods. Care must be taken to avoid this.

Use:

Use of the walkie talkies must be limited to strict necessity. While you are transmitting, nobody else within range of your set may. It is somewhat like using a "party line." Also, indiscriminate use wastes battery power. When an emergency arises, this battery power may be one of the Team's most precious assets.

Moisture:

A slight amount of moisture condensed in a walkie talkie can stop its operation. The set must be protected from contact with moisture. Carry it under your raincoat or poncho on misty or rainy days. A plastic bag can also be used to protect it, especially in a pack.

2.5.6 LINES OF COMMUNICATION

Because communications are so important to teamwork, every member of any team must be constantly aware of what are called "lines of communication." This is the means he has of communicating with his leader and, conversely, his leader with him. A Team or a Team member who remains out of communication with others becomes an individual, not part of a Team. His efforts will be totally uncoordinated with others'. While maintaining unit communications is a command responsibility, each individual has the responsibility to reestablish contact with his leader or Team when he becomes unexpectedly detached or when he has finished his assignment.

Rally Points:

At the start of each mission, a Team should set up a Rally Point and each Ranger must know its location perfectly. The Rally Point is a place where everyone will go if the Team becomes separated. Several may be used during a mission.

Time Limits:

Each assignment given a Ranger or Team should have a time limit assigned or some definite action to be performed upon completion (such as "reporting in"). You will recall that the first voice command example in section 2.5.1 gave the two scouts a 5 minute time limit for their reconnaissance. This not only gave them a good idea of how far to go, but insured that communications would be reestablished with them in a reasonable time. Sticking conscientiously to these time limits or completion reports is an important attribute in a Ranger.

Emergency Communications:

Each Ranger Team will have some means of reestablishing communications when a Rally Point does not exist or cannot be used. In most cases this will consist of all parties contacting the closest State Police unit. Whatever means is chosen, each individual is responsible for knowing the method and applying it if needed. To this end, some small coins for telephoning should always be carried.

SECTION 2.6
PHYSICAL FITNESS

Rescue work may unexpectedly demand the utmost physical endurance and exertion by those engaged in it. During an emergency there is no time to "get in shape." Every Ranger must keep himself in top physical condition at all times. This program has no room in it for a "softie" who thinks the effort is all mental. The human body gets accustomed to either a life of no exertion or a life of physical training. A body accustomed to no exertion will physically fail if suddenly placed under continued stress. Ranger Teams cannot afford this!

Regular exercise is the key to staying in good physical condition. This takes will power. The physical fitness program used by CAP (see CAPP 35) should be enough to keep any Ranger in good condition if he follows it regularly. The responsibility for keeping in good condition rests squarely on the shoulders of the individual Ranger. A good Ranger Team Commander will, however, occasionally check up on his Team's condition.

Look up the physical fitness test requirements for the Ranger and Expert Ranger grades in Appendix III. Check and see if you can do them. If not, start NOW on an exercise program to strengthen yourself until you can do them with ease.

SECTION 2.7
MOBILITY

In order to carry out the simplest mission, all Rangers need mobility - the ability to travel from point A to point B. The major portion of such traveling, of course, is done by vehicle. To this end, a Team's vehicle must always be maintained in good condition. The vehicle, however, can only get the Rangers close to their objective in most cases. The ultimate mobility of a Ranger Team rests on the individual mobility of its individual members on foot. Usually this does not pose a problem other than one of knowing exactly where one is going. This is dealt with under Navigation (2.2). Problems can arise, however, under two circumstances:

- Obstacles of Terrain
- Obstacles of Weather

The following sections deal with how to overcome these obstacles.

2.7.1 STEEP TERRAIN OBSTACLES

In many parts of the country, mountains, cliffs, or other steep terrain may hamper the mobility of a Ranger Team. Airplanes are particularly prone to crashing into a fog shrouded mountain top, sometimes posing a real challenge to a Ranger Team. With a little training, however, such terrain is not insurmountable and can be reduced to a difficulty based only on the physical fitness of the individual Rangers. The following passages, abstracted from AFM 64-3 are of particular aid to personnel faced with a steep terrain challenge.

"Route-Finding

"The novice is prone to follow a compass line. The experienced man follows lines of least resistance, recognizing at a glance that a curved route may be shorter and easier, that an apparently innocuous stretch of forest may be filled with windfalls, or that a smooth, green meadow may contain a series of beaver ponds, which hamper travel or make it almost impossible.

"Use game trails when they follow your projected course. Trails made by migrating caribou are frequently extensive and useful. On scree or rock slides, mountain sheep trails are helpful. Moose and bear trails are almost always unreliable, frequently leading into almost impenetrable thickets or swamps. Other routes offer varying prospects, such as the chance of securing game or of locating waterholes.

"Route-finding through wild country requires great concentration, knowledge of wilderness "road signs," common sense, and judgment. Fortunately, trailwalking techniques develop progressively with experience, and a clear mind registers observations and forms deductions almost subconsciously.

"Calmness, self-confidence, constant watchfulness, courage, caution, and unlimited patience - all characteristics of the best types of outdoorsmen - develop with time.

"Mountain Walking.

"Mountain walking, depending on the general formation of the ground to be crossed, involves four different techniques. However, two fundamentals apply to all four techniques, and you must master both of these fundamentals in order to expend minimum energy and time.

"You must keep the weight of your body DIRECTLY over your feet and you must place the soles of your shoes FLAT on the ground. You can accomplish both of these most easily by taking small steps and moving at a slow, steady pace.

"Hard ground generally is firmly packed dirt that will not give way under the weight of a man's step.

"When ascending hard ground, apply the two procedures mentioned previously and the following in addition:

- Lock your knees briefly at the end of each step in order to rest your leg muscles.
- Traverse steep slopes and, if necessary, climb in zigzag direction and not straight up.
- Turn at the end of each traverse by stepping off in the new direction with the uphill foot. This prevents crossing your feet and possibly losing your balance.

"When traversing hard ground, you can place the full sole of your shoe down flat most easily by rolling your ankle away from the hill with each step.

"For narrow stretches, you may use the herringbone step. Ascend straight up a slope with your toes pointed out and using all of the other principles already outlined.

"Descending over hard ground is best accomplished by the following procedures:

- Come straight down without traversing.
- Keep your back straight and your knees bent so that they take up the shock of each step.

- Keep your weight directly over your feet and place the full sole on the ground at each step.

- Walk with a slight forward lean and with your feet slightly pigeon-toed.

"In mountainous terrain, grassy slopes are usually made up of small hummocks of growth rather than a continuous field of grass. To ascend, step on the upper side of each hummock where the ground is more level than on the lower side. Traverse with a slow, rhythmic, walking motion. Never run, because running on hard or uneven terrain can result in a sprained ankle. To descend, use the techniques mentioned for hard ground.

"Scree slopes consist of small rocks and rock particles which have collected under cliffs. Scree varies in size from sand particles to pieces the size of your fist. Occasionally it is a mixture of various sizes, but normally each scree slope is made up of the same size particles.

"To ascend scree is extremely difficult - avoid it when possible. All principles of ascending hard ground apply, but you must pack each step carefully so that your foot does not slide down when weight is placed on it. You can do this best by kicking in with the toe of the upper foot and the heel of the lower foot.

"To descend scree, come down in a straight line. It is important to keep your feet in a slightly pigeon-toed position as well as to keep your back straight and your knees bent. Since there is a tendency to run down scree, take care not to attain too great a speed and thereby lose control. By leaning slightly forward, you can obtain greater control.

"When a scree slope must be traversed and no gain or loss of altitude is desired, use the hop-skip method. This is a hopping motion in which the lower foot takes all the weight and the upper foot is used only for balance.

"Talus slopes are similar in makeup to scree slopes, but the rocks are larger. To walk on talus, step on top of and on the uphill side of the rocks to keep them from tilting and rolling downhill. All other previously mentioned fundamentals apply.

"General Precautions in Mountain Walking

"It is of the utmost importance that you do not kick loose rocks so that they roll down hill. Falling rocks are extremely dangerous to men below, and they also make a great deal of noise. Carelessness by anyone in this respect can cause a well-planned mission to fail, since one

rock no larger than a man's head can kill or severely injure several men, as well as ruin all security measures.

"Step over rather than on top of obstacles such as rocks and fallen logs to help avoid fatigue.

"Talus usually is easy to ascend and traverse while scree is a better avenue of descent.

"Balance Climbing

"Balance climbing is the type of movement used to travel on steep slopes. It combines the balanced movement of a tightrope walker and the unbalanced climbing of a man ascending a ladder. Body position is very important.

"Climb with the body in balance - that is, with your weight poised over your feet or just ahead of them as you move. Your feet, not your hands, carry the weight except on the steepest cliffs - your hands are for balance. Your feet will not hold well when you lean in toward the rock.

"With your body in balance, move with a slow, rhythmic motion. Use three points of support, such as two feet and one hand, whenever possible. Handholds that are waist- to shoulder-high are preferable. It is better to use small intermediate holds rather than stretching and changing to widely separated big holds. Avoid a spread-eagle position in which you stretch so far that you cannot let go.

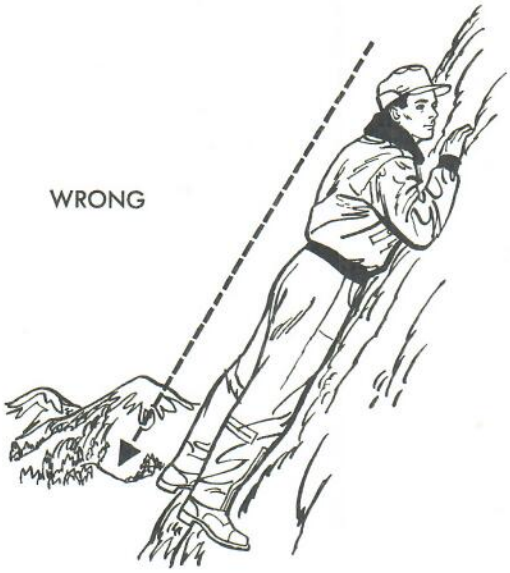
"In descending, face out when the going is easy, sideways when it is hard, and face in when it is extremely difficult. Use the lowest possible handholds.

"You must relax, because tensed muscles tire quickly. When resting, keep your arms low so that circulation is not impaired.

"Basic Holds. Pull holds are those with which you pull down; they are the easiest to use but also the most likely to break out.

"Push holds are ones with which you push down; they help you to keep your arms low. They rarely break out, but they are more difficult to maintain in case of a slip. A push hold is often used to advantage in combination with a pull hold.

"Friction holds depend solely on the friction of your hands or feet against a smooth surface. They are difficult to use because they give you a feeling of insecurity, which most climbers try to correct by leaning close to the rock, thereby increasing their insecurity. Friction holds



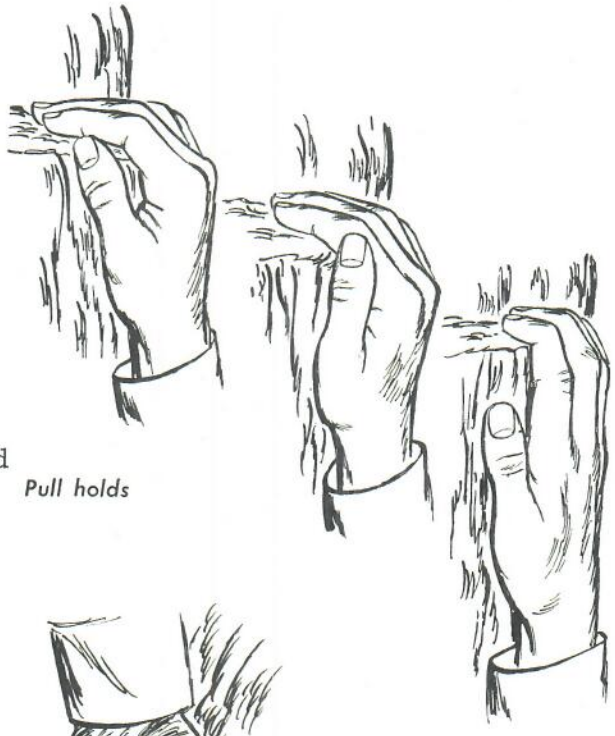
Body position

often serve well as intermediate holds, some of which give needed support while you move over them but which would not support you were you to stop on them.

"Jam holds involve jamming any part of your body or an extremity into a crack. Put one hand into a crack and clench it into a fist or put one arm into a crack and twist the elbow against one side of the crack and the hand against the offset side.

"You can combine and vary the above basic holds. The number of variations depends only upon the limit of your imagination. A few common combination holds are illustrated.

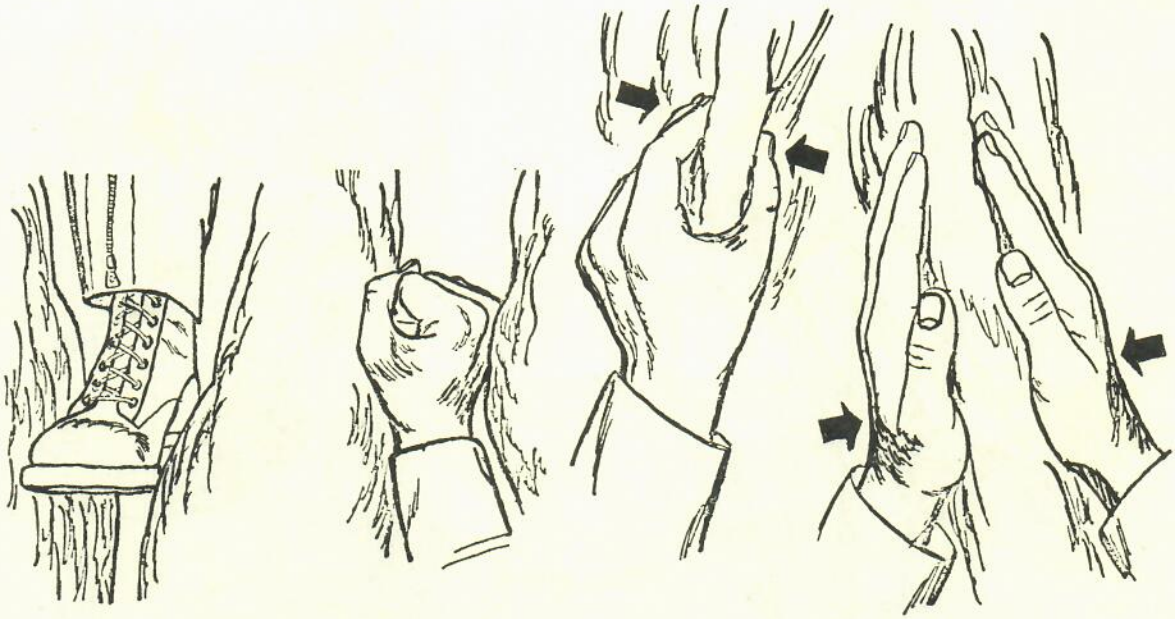
"Pinch a protruding piece of rock firmly between your fingers and thumb.



Pull holds

Push hold

Hand holds



Jam Holds

Pinch Holds

"Lean to one side of an offset crack with your hands pulling and your feet pushing against the offset side.

"The inverted pull or push hold is also called an under hold. It permits cross pressure between your hands and feet.

"In chimney climbing, exert cross pressure between your back and feet, hands or knees.

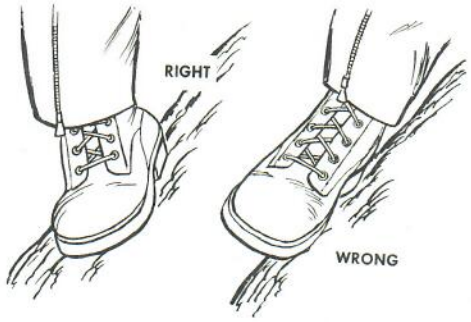
"The foothold is a common hold. The service shoe with rubber sole will hold on rock slabs that slope as much as 45°. On steep slopes, keep your body vertical and use small irregularities in the slope to aid foot friction.

"Use of Holds. A hold need not be large to be good nor must it be solid as long as the pressure you apply keeps it in place. Experienced climbers use holds so small that they are scarcely visible. You must roll your feet and hands over the holds and not try to skip or jump from one to another.

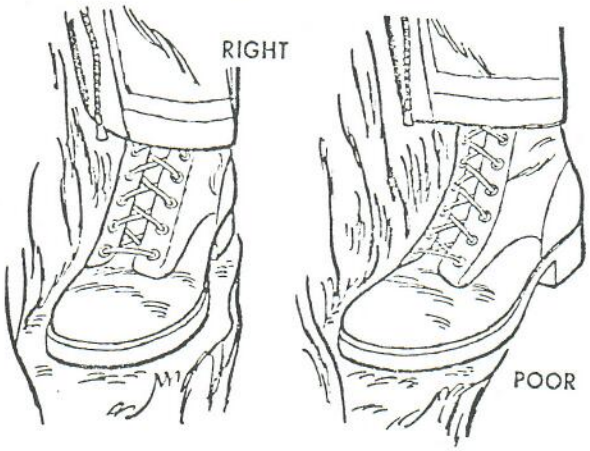
"When traversing, however, it is often desirable to use either the hop step, in which you change feet, or a small hold with which you may move sideways more easily. This useful step involves a slight upward hop followed by precise footwork.

Inverted pull hold

Chimney climbing technique



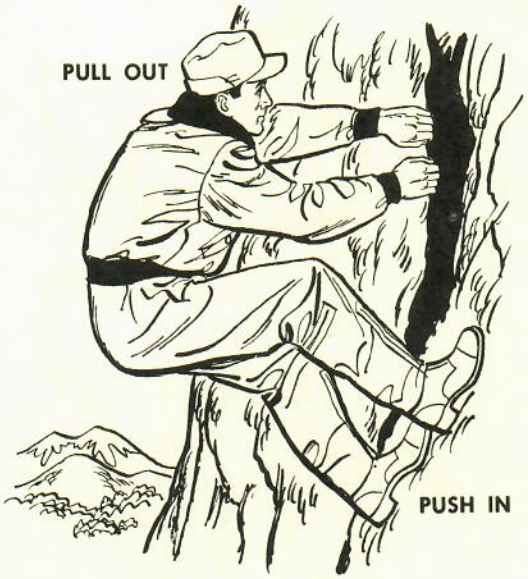
Footholds



Chimney climbing

Mountain Climbing Techniques

Friction Foot Hold



Lie-Back

"Margin of Safety. Carefully test each and every hold before applying full pressure to it. Keep a margin of safety by never attempting to climb to the full limit of your ability. Carefully assess the climbing ability of yourself and all other members of your climbing party. Then, with equal care, study the terrain to be covered. Make every effort to plan climbs so that the least able climber in a group is never pushed to the fullest extent of his ability."

Use of Ropes

The preceding passages cover the basic techniques of climbing and hiking, but there is one skill a Ranger or Ranger Team can use that will greatly increase both safety and speed. That is the proper use of ropes.

Each Ranger Team should have a length of nylon climbing rope (see Team Equipment, Section 3.2). This is a strong, lightweight rope that can be used in two ways:

- As a safety line for individuals crossing a particularly dangerous stretch of terrain.
- As an aid in descending steep terrain.

The use of rope is thoroughly discussed both in FM 31-72 (Mountain Operations) and in "Belaying the Leader." Each Ranger Team should have one of these two books available for its members to read.

Safety Ropes

The following material on using the rope as a safety line is intended only as an introduction. Belaying, the art of acting as an "anchor man" on a safety rope, is a subject for a whole book in itself. The finer points are an absolute necessity for serious mountain climbing, but some of the basic elements will aid any Ranger Team to do many jobs more safely.

When terrain is steep enough so that a Team member would be seriously endangered by a fall, one end of a climbing rope should be fastened to him (a bowline loop around the waist will do - or a variety of other techniques) and the other end given to an anchor man or belayer. The belayer finds himself a safe, secure spot from which he cannot be pulled by tension on the rope. If necessary, he can tie himself with a separate rope to a tree or piton anchor. The belayer then arranges the rope so that it is wrapped around his body. There are a wide variety of ways to do this, but one of the simplest is to use the identical arrangement described in the Hasty Rappel (see the following section). The belayer then manages the safety rope between him and the climber. The "brake hand" holds the trailing end of the rope. The belayer must follow the following rules:

- Never let attention wander from what the climber is doing - be ready for a fall at all times.
- Never take his brake hand off of the rope. Use the other hand to pay out and take in rope.

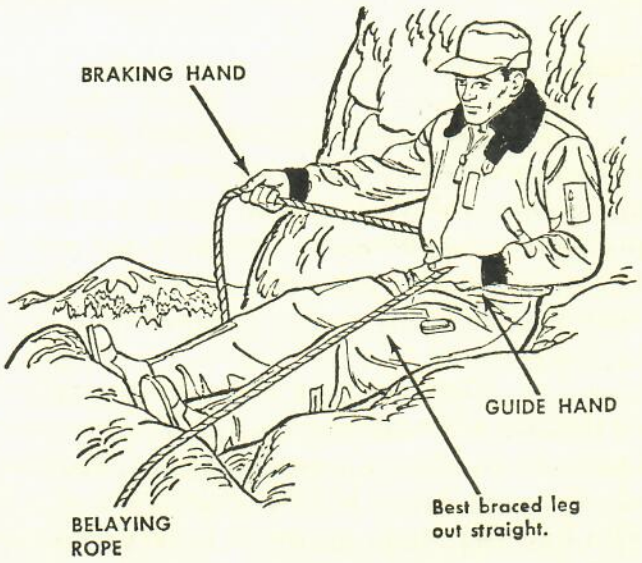
If the climber falls, the belayer brings the brake hand into brake position (up to opposite shoulder) and gradually stops the climber by the increased friction of the rope on the belayer's body.

Note: The belayer must wear leather gloves to guard against rope burn.

The safety rope must not be anchored rigidly to an immovable object. If the climber falls, he must be stopped gradually, not with a sudden jerk. The sudden jerk stop will break either the climber, the rope, or the anchor. A fall of only a few feet can momentarily generate a several thousand pound pull in a rope system that is rigidly fastened.

Further, the loose end of the rope must not be tied to the belayer. If he cannot stop the fall of the climber before all the rope has been paid

out, the belayer must watch the end leave him, knowing that he has already slowed down the climber as much as possible. It is now the belayer's job to rescue the fallen climber. This he cannot do if he has been jerked off his perch or has sustained a broken back from the tremendous jerk which would have occurred, had he been securely fastened to the rope.



Belaying from Above

Ropes can be used as safety lines in many other situations than mountain climbing - walking on thin ice, fording or swimming a river, etc. Please note the following:

- Do not be afraid of appearing to be a "sissy" by using a rope as a life line. Such use is merely applying common sense. Aside from the personal safety involved in a possible accident, remember this: A Ranger Team that has an accident involving one of its members has failed its mission!!! Treatment and evacuation of the injured party usually prevents timely completion of the assigned mission.

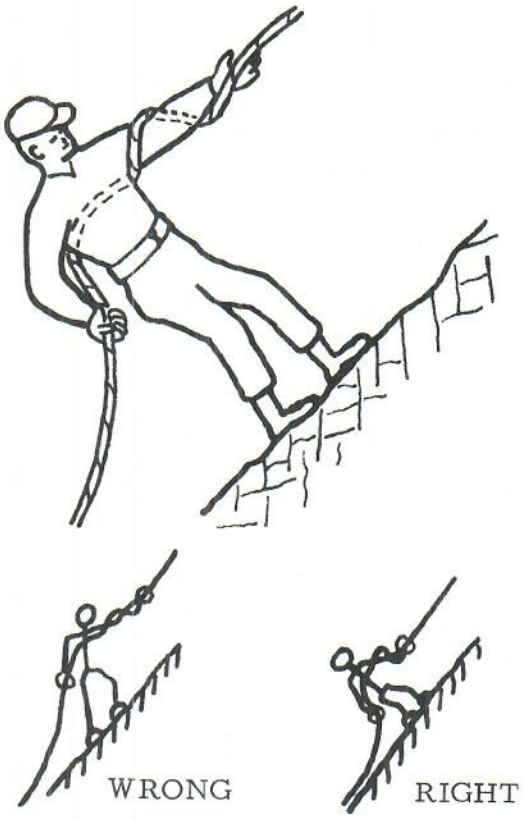
- Several mountain climbers have fallen to their deaths while traveling over terrain they considered "easy." They had ropes in the party but felt it beneath their dignity to use them.

Rappelling

Rappelling is the art of sliding down a rope with controlled friction. Many different rappelling techniques exist, but only two will be covered here.

The first technique is the Hasty Rappel. This requires only a rope, gloves, and a long sleeved shirt or jacket. It is, as the name implies, quick and easy to use. It can be used for descending steep inclines (even when wet or slippery) but cannot be used for vertical cliffs. In using the hasty rappel, you must keep your footing at all times. In order to do this, it is necessary to keep one's body straight and perpendicular to the slope. Once this technique is mastered, no difficulty will be experienced. There is a great tendency for beginners to want to keep their bodies vertical. This leads to poor footing and disaster. The hasty

rappel is accomplished by passing the rope across the back, under the armpits, and through each hand. (One end of the rope is securely anchored at the top of the slope and the other hangs free.) To increase friction, a wrap may be taken around one or both arms. The rappeller then proceeds to walk sideways down the slope, putting much of his weight on the rope. The rope slips around him and the friction between him and the rope controls his rate of descent. To stop, the hand holding the trailing rope is raised to the opposite shoulder. This increases the angle of wrap of the rope around the body and greatly increases the friction. (Friction increases exponentially as the angle of wrap increases.) Although gloves are worn to prevent rope burns on the hands, the rope is not gripped tightly to control friction. Controlling the angle of wrap is sufficient.



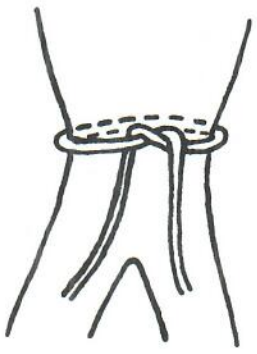
Hasty Rappel

The second rappelling technique (which can be used for vertical cliffs or hanging free) requires two additional pieces of equipment: A "Ranger Rope" (12 foot length of 5/16" or 3/8" nylon rope) and a carabiner ("snaplink"). It is recommended that CAP Rangers use only steel carabiners with locking gates unless they have become expert in mountain climbing techniques.

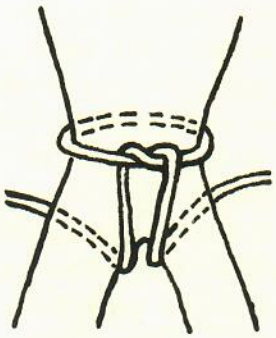
Note: The following instructions must be followed exactly for safety. A slight deviation from the proper technique can cause the carabiner to come unlocked and pop open in the middle of a rappel, causing complete loss of control and rapid (!) descent. (For this reason, a qualified person should inspect each "hook-up" before a rappel is made.

1. Make sure the rappelling rope is securely anchored at the top and hanging free.

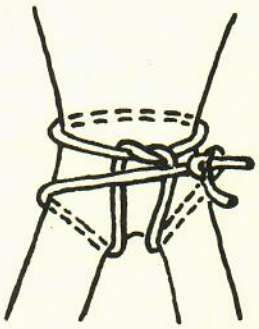
2. Using a 12 foot ranger rope fashion a "Swiss Seat" as shown



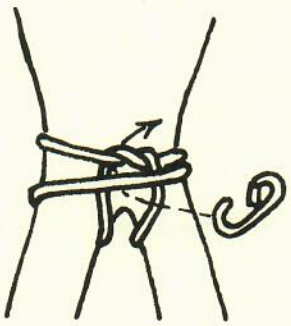
at the right. The rope is looped around the waist and tied with an overhand knot. The ends are then carried down, through the crotch without crossing, up in the rear under the buttocks, around the sides, still without crossing, brought around the front, and tied at the waist to one side. The knot is a square knot with each end "faced off" with a half-hitch.



3. Attach the carabiner to the front of the Swiss seat, making sure that all three strands of rope are inside the carabiner. (Two strands in the overhand knot and one strand from the last step in tying the seat.)

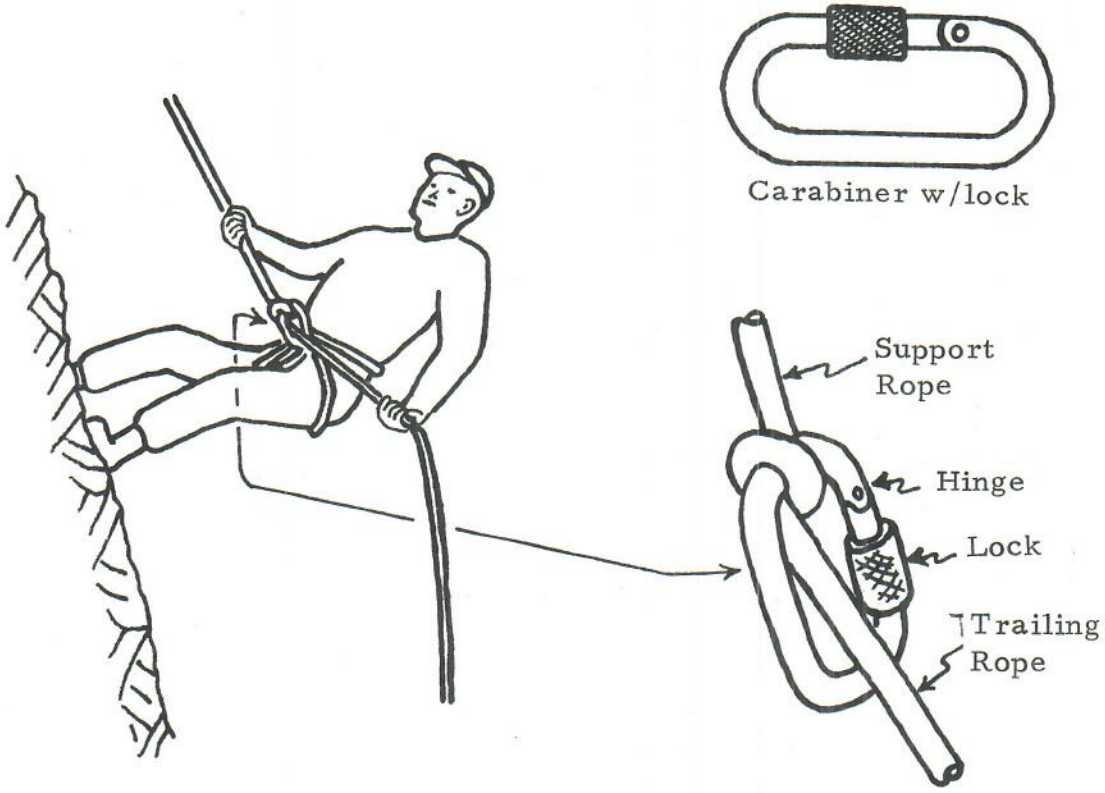


4. Make a loop with the rappel rope as shown on the next page and clip it into the carabiner. Make sure two strands of this rope are inside the carabiner. (4 strands if a doubled rope is used.)



5. Carefully check the hook-up. The support end of the rappel rope should come down on your right, pass through the carabiner, loop around and pass through again - emerging under the first loop and trailing away to your left. As you slide down the rope, the movement of the rope should tend to tighten the lock of the carabiner if the two contact.

6. The descent is made holding the support rope in the right hand and the trailing rope in the left hand, each hand being about 18 inches away from the carabiner. Feet are placed perpendicular to the cliff and a controlled slide down the rope begins. The slide is controlled by the position of the left hand. To halt, bring the left hand with the trailing rope up to the right shoulder. This crosses the rope at the carabiner and greatly increases friction. Gloves should be worn, but it is not necessary to grip the rope tightly - friction is controlled by varying the angle of wrap at the carabiner with the left hand.



Rappelling

Carabiner Detail

Safety

A word or two about safety in rappelling is in order here.

1. In any training situation, a rappeller must be protected by a second rope attached to him and handled by a belayer. This second rope is to prevent a disastrous fall in case of:

   a. an improper hook-up
   b. an inexperienced rapeller
   c. breakage of the main rope or failure of its anchor point.

2. The hook-up should always be carefully checked before a rappeller starts - preferably by the most experienced person in the group. Points to check are:

   a. the brake rope (the trailing rope) should function properly
   b. the rope should tend to tighten the carabiner lock during descent.

> The speed with which a moving rope can open a carabiner lock, flip open the gate, and convert the carabiner friction brake into a free-running "pulley" is frightening. This will only happen, though, if the moving rope tends to open, or unscrew, the lock.

As mentioned before, rappelling can be the safest and quickest way to descend much terrain. It must, however, be done properly and is not to be attempted by beginners without instruction.

"Belaying the Leader" is an excellent source for much written information on safety in mountain climbing. Its purchase is recommended to all who intend to take up the sport.

Safety in Mountaineering

Besides the use of ropes, already covered, there are some other safety techniques used in mountainous terrain.

- Be careful not to knock or throw stones or any hard object over the edge of a cliff. People may be below. If you do knock something down, immediately call out "ROCK" or "STONE" in your loudest voice. This will warn people below. Call out "ROCK" even if it is some other hard object such as a canteen.

- If you are climbing and hear "ROCK" or "STONE" from above, DO NOT LOOK UP. Immediately take shelter as best you can. Protect your head with your arms.

- Wear a fiberglass hard hat whenever possible. A crash helmet is even better. International Orange is the preferred color.

- For a detailed explanation of lightning hazards in mountainous terrain, read "Lightning Hazards to Mountaineers" by A. E. Peterson. (See References).

2.7.2 WATER OBSTACLES

Other than the "nuisance" type of obstacle, such as a stream that can be forded at the cost of wet feet, or a lake that can be detoured, these obstacles fall into two categories: rivers, and swamps.

Rivers

Rivers may be crossed by swimming, bridging, or boating if they are too deep to ford.

A small group of men, all swimmers, may elect to merely swim the river. Equipment may be a problem, but usually some type of small raft can be constructed with logs and a poncho to float the equipment across. If the Team's rope can reach across the river, it should be used as a lifeline for each person swimming across.

A bridge of either ropes or logs may be constructed if the material is on hand and if it is necessary to cross a large number of men, perhaps carrying a casualty. At least one man usually has to swim the river to help in bridge construction. FM 31-72 (Mountain Operations) has an excellent section on bridging.

If a boat is available, it should be used. This is especially true for wide or swift rivers. Otherwise a raft may have to be constructed to hold both men and equipment, although this is a fairly ambitious project and should be considered as a last resort.

FM 21-76 (Survival) contains an excellent description of river crossing techniques.

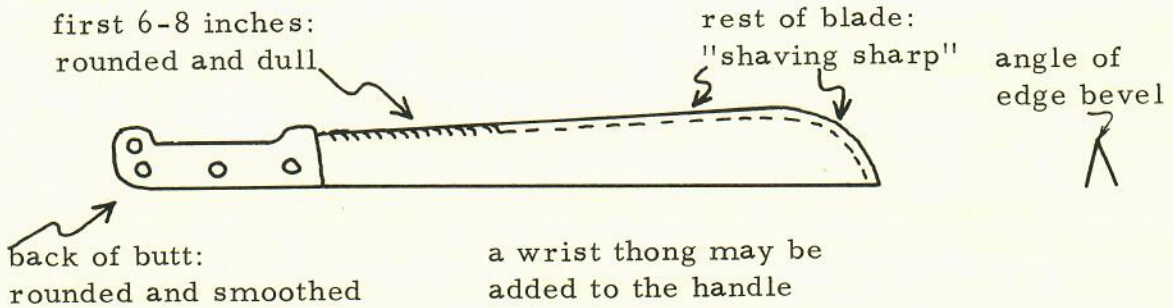
Swamps

Swamps have a large nuisance value. Except in the southeast, where they may be extensive wildernesses, most swamps can be crossed rather easily by either wading or "hummock hopping." Occasionally swamps contain deep pools of quicksand or quagmire. FM 21-76 recommends crossing these by swimming! If you cannot detour or bridge the obstacle, the manual says "Cross it by falling face downward with your arms spread. Start swimming or pulling your way through, keeping your body horizontal." Note: this is not done with a backpack on! Quicksand, it should be noted, is a suspension of sand in water and as such is more dense than water so a person can float with no trouble. There are no mysterious currents that try to "suck" a "victim" down. The very real danger is that a person in a quicksand pool will wear himself out struggling or that he will panic and make his motions opposite to those of swimming.

2.7.3 VEGETATION OBSTACLES

Vegetation obstacles, such as briar thickets, scrub, etc., can be a nuisance for an individual man, but for a Team carrying a litter with a casualty they can be a serious obstacle. The remedy is a simple one: cut your way through.

The primary tool for accomplishing this is the machete. As an absolute minimum, at least two machetes should be with every Ranger Team in the field. The individual machete must be kept in good condition, however, or it is worthless. Each machete should be modified as shown below before use.



Modifications to Machete

In use, the machete is swung easily with a snap of the wrist just before contact with the branch. With very little effort, a sharp machete will cut cleanly through a live, 2 inch diameter branch. It will also cleanly cut free-standing briars. A dull machete will do neither. Because the speed of a Ranger Team carrying a litter depends directly on the efficiency of the two men clearing the trail, it is the responsibility of the Ranger Team Commander to frequently inspect the individual machetes in a Team and insure both that (A) they are sharp and (B) their owners know how to use them.

Two men are normally used to clear the trail, but they work in tandem, not side by side. One goes ahead, picking the route and doing preliminary clearing. The second follows about ten feet or more behind him - well out of range of a swinging machete! All other personnel must likewise keep well clear of the second man.

2.7.4 SNOW OBSTACLES

Snow can be the most difficult obstacle of all to overcome. The problems it presents are:

- Cold
- Reduced Visibility
- Reduced Mobility

The effects of cold are discussed under Medical (section 2.3) and Equipment (section 2.1.2). Reduction of visibility from falling snow gives navigation problems similar to those encountered at night, and night navigation techniques (section 2.2.5) will help overcome these. ("Snow blindness" can also occur from overexposure of the eyes to strong light glare from fallen snow. Use sun glasses or goggles to prevent

this. See AFM 64-5 for a full treatment.) Deep snow lying on the ground presents a very real challenge to maintaining mobility. This section will discuss ways of maintaining mobility.

Vehicles must be used carefully to prevent their becoming stuck. Careful driving will usually prevent this. A bogged vehicle must be rescued, which takes important time out from completing the mission. The use of tire chains will, of course, greatly reduce the chances of a vehicle being stuck. A stout rope, with the entire Ranger Team pulling on it, is often more effective in freeing a vehicle than having the Team attempt to push the vehicle. The same rope can be used as an improvised windlass for a very short pull by tying one end to the vehicle, the other end to a tree, and twisting the rope with a stick - much in the same fashion as a tourniquet is tightened. Special purpose vehicles, such as weasles and snowmobiles, can give very good short range mobility in the snow if they are available.

The mobility of the individual Ranger can be very much improved by the use of snowshoes or skis. Snowshoes are probably the better of these for general purpose Ranger use and require no great skill to use.

A snowshoe consists of a light wooden framework with a rawhide or rope webbing laced across it. Usual dimensions are about 1 foot wide by 2 feet long. One snowshoe is fastened to each foot by a binding similar to a ski binding. The snowshoe distributes a person's weight over a larger area so that one either does not break through the surface crust of the snow or else sinks in only a short way before the snow is compacted enough to hold one's weight. Under conditions of the latter sort, if only one or two members of a Ranger Team are equipped with snowshoes, they can "break trail" for the rest of the Team and speed up progress considerably. Breaking trail is a very tiring job, and the "honor" should be rotated at decent intervals.

Snowshoes must be revarnished, both frame and webbing, each year. If the webbing is rawhide, the snowshoes must be stored where rodents will not gnaw on the webbing. This also applies at an overnight camp where nocturnal visitors are often about.

Sleds, either with ski-like runners or constructed like a toboggan, can be very useful for carrying equipment or a casualty.

On mountainous snow and glaciers, special mountaineering techniques have been developed using ice axes and crampons. AFM 64-3 (Survival) touches on these techniques, but a better treatment is contained in Mountaineering, The Freedom of the Hills. Further discussion of these techniques is beyond the scope of this book.

Ice creepers, small spiked attachments for the bottom of boots, can make a huge difference in mobility when the ground is covered with ice. Ice creepers cost very little and can be carried easily. They have been known to come in very handy in crossing a stream on a wet, snow covered log also.

One word of precaution is in order before any winter missions are undertaken. Every member of the Ranger Team must be familiar with cold weather survival beforehand. Very close Team control must also be exercised to make sure that any members of the Team who stray away will be missed immediately and a search started as soon as possible. Being lost in the summer can be interesting. Being lost in the winter can easily be deadly.

SECTION 2.8
FIREARMS FAMILIARIZATION

Although we live in a relatively civilized country, there are times and circumstances when even the meekest of us may have to use a weapon as a means of survival - either because we are faced with wilderness survival or because of threat or actual attack by a hostile being. Although a wide selection of weapons is available, ranging from a stone, club, or knife through a bow and arrow, by far the most efficient weapon, both from the standpoint of food procurement and self protection, is the firearm. To that end, every man who tries to train himself to be prepared to survive the unexpected should become familiar with the operation and proper use of firearms.

NOTE: CAP IS NOT AN ARMED FORCE, IT IS A NON-COMBATANT AUXILIARY OF THE AIR FORCE. No national CAP regulations give CAP members any right or authority to violate any local laws regulating the carrying or use of firearms.

2.8.1 NATIONAL RIFLE ASSOCIATION

The National Rifle Association (NRA) has established two programs of interest to CAP personnel. (1) A hunter safety program. (2) A junior marksmanship program. Both of these programs offer highly qualified instruction on a local level. They are aimed at teaching a novice the fundamentals of firearms handling, marksmanship, and safety. Personnel of each CAP Ranger Team are urged to enroll in these courses locally.

2.8.2 SAFETY

The primary thought, foremost in the mind of every person handling a weapon as dangerous as a firearm, must always be for safety. It is sometimes hard for a novice to understand how easy it is for a gun to go off when the handler does not expect it to. Some common accidents with guns are caused by:

- Handling an "empty" gun without checking it.
- Losing one's footing while carrying a rifle or shotgun.
- Mechanical failure of a safety device.
- "Horseplay".

Because of the danger involved in handling firearms, U. S. Army instructors have long taught the following rule:

"Never point a rifle at a person you do not intend to kill."

This may sound brutal, but it is a good slogan to keep in mind. It may keep you or your best friend alive some day.

2.8.3 SIGNALING

Firearms make a very effective signaling device in case of disaster or if one has lost his way. The universally recognized signal calling for help is three evenly spaced shots. There is no universal agreement on timing for the shots, but approximately ten seconds is common. The three shot signal should be repeated after about one minute if no answer is heard.

To give the signal - fire three shots with a ten second spacing between shots. If no answer is heard, fire three more shots after about one minute. If no answer is heard, wait about an hour and try again.

To respond to the signal - fire one shot after you have heard a three shot signal. This is your way of saying that help is on the way. If the three shot signal is a genuine call for help, your shot will be answered by one shot from the victim. Start walking in the direction of the shots. If you need a new bearing on the sound, fire one shot and the victim will answer with one shot. This may be repeated until you have located him. Remember though, his ammunition supply may well be limited and you should try to do as much of the work of locating him as you can without making him fire.

SECTION 2.9
LEADERSHIP

(Advanced Ranger candidates must study.)

"Leadership," not only the ability to lead a group but also to train them, is of prime importance in a well-functioning Ranger Team. As a potential leader of Rangers it is imperative that you understand the techniques of leading and training your Team. This section of the manual is designed to give you the basic groundwork for developing your own leadership skills.

2.9.1 THE LEADER*

One of the prime assets of a good commander or teacher is the ability to inspire and lead a group of people. Good leadership often appears to be an inherent ability, since the truly accomplished leader almost always carries out his tasks of direction and guidance in a seemingly "natural" manner. But leadership skills can be developed, and hence the attributes of a good leader are worthy of discussion. Before entering such a discussion, however, let us begin by attempting to arrive at some basic definitions.

> Lead (verb): to guide or conduct; hence, to direct in action, thought, opinion, etc.; instruct; to precede and direct in movement; as, to lead an army; hence, to be foremost among; to draw or direct by influence. (Webster's New Collegiate Dictionary)
>
> Leader (noun): one that leads; a guide; conductor; a chief; commander. (Webster's New Collegiate Dictionary)
>
> Leadership (noun): the art of influencing people to progress with cooperation and enthusiasm toward the accomplishment of a mission. (U.S. Air Force)

Let us expand the U.S. Air Force definition of leadership: "Leadership is an art rather than a science, because it deals with men and their changing moods and attitudes instead of unchanging physical elements such as those studied by the natural sciences. Good leadership will imbue the men under it with enthusiasm and a spirit of cooperation with others in carrying out the assigned mission." But what produces a good leader and his leadership abilities?

A person aspiring to a leadership position may have many inherently good qualities but, in any case, he should know the character prerequisites and qualities associated with effective leadership. Further, he should practice them at every opportunity.

*NOTE: Major portions of this section have been abstracted from the USAF manual "Leadership" used in the ECI Course 7c. See Reference 18.

Character Prerequisites:

1. Integrity--This concept consists of honesty, loyalty, and morality on the part of a leader to all those persons with whom he comes in contact.

2. Willingness to Accept Responsibility--A person assuming a leadership position must also be a person willing to assume responsibilities. There is no position of command that does not carry many responsibilities with it. They are inherent in a command position. You have a responsibility to your commander, mission, and men. A person cannot lead without having a very high degree of responsibility to all concerned. This means, "think before you act!" Consider the effect of your actions on all concerned; then make a decision and stand by it, but do not be afraid to admit you are wrong.

   NOTE: You can delegate authority, but not responsibility. As a commander you are responsible for the actions of those persons under your command.

Qualities of a Leader:

A poll taken among Air Force NCO's disclosed ten personality traits which these men most wanted to find in their officers.

1. Knowledge--Know all aspects of your job thoroughly, but do not be afraid to admit that you do not know something. People find out very quickly when someone tries to "bluff" his way through an answer, and this will eliminate you as a good, effective leader.

2. Judgment--The ability to make sound decisions based upon the available information and opinions on the subject in question. Ask those around you for their information, advice, and opinion on the problem, but you make the final decision.

3. Tact--The ability to make a statement with the greatest honesty and sincerity while giving the least possibility of offense. Your choice of words and method of delivering your decision, opinion, or order will play an important role in your use of tact.

4. Justice--Of all the qualities we are discussing, justice is perhaps the most difficult to attain. It means that you must:

- Try to rid your mind of prejudice.
- Consider each man in terms of his performance and behavior.
- Give your men to understand that they can expect fair treatment at all times.
- Remain fair, firm, consistent, impersonal, and impartial.

You must not let personal considerations stand in the way of your judgment of an individual. All these things mean that you must impose upon yourself a rigorous mental self-discipline.

5. Initiative--The willingness and ability to originate and carry through a necessary thought or act without supervision.

6. Courage--The mental control of the fear of both mental and physical pain.

7. Endurance--The ability to withstand continued pain, fatigue, hardship, and distress without breaking. Put another way, endurance can be thought of as the ability to stick to a job and see it through despite all difficulties.

8. Dependability--This means that a man can be relied upon to do that which has been assigned to him or which he has promised he would do. A good leader never fails to be dependable.

9. Bearing--Every outward aspect of your character. This is your outward presentation of your leadership qualities. It is what other people see. Some people refer to this as your "Command Presence." Good bearing involves your facial expressions, tone of voice, enunciation, gestures, dress, walk, and general social conduct. It must show others that you are a clear-headed, decisive individual, with pride in yourself, your uniform, and your mission.

10. Enthusiasm--The expression of inward positiveness. This quality brings to life the other qualities of leadership which we have discussed. Remember: "Enthusiasm is contageous," and will make your job as a leader easier and more successful.

The qualities just discussed are not isolated aspects of a good, effective leader. They are highly dependent upon each other for their

effectiveness; they modify and qualify one another to a large degree. There is no definite order of importance of these qualities. They are all extremely necessary to the personality of a leader, and the importance of any one of them at a given time is completely dependent upon the existing conditions and circumstances.

One point that is often missed or skimmed over in the discussion of leadership is: familiarity with your men. You have probably often heard the expression, "the loneliness of command." As human beings, we all want to be liked and accepted as part of the group, but leadership entails the maintenance of a certain amount of aloofness from individual members of your Team. You must not become "one of the boys." As a commander you are not out to win a popularity contest among your men. Finding this critical point of familiarity with your men may be difficult, since that point is likely to change from one group to another, and from one situation to another. If you become too familiar, too much a part of the gang, you will lose your command effectiveness. Too much aloofness can cause a loss of command effectiveness also. Each leader must temper the above to be consistent with his natural personality. He should endeavor to study himself and adopt a course of action that he feels is neither "too familiar" nor "too aloof."

The scope of this manual does not permit an extensive discussion of leadership. We have tried to condense this information down to the main factors involved in this subject. Further study on leadership techniques, and taking advantage of every opportunity to practice leadership is necessary for anyone wishing to become a good leader. Books and manuals on leadership are given in the list of references at the end of this manual.

2.9.2 DRILL AND CEREMONIES

As members of Civil Air Patrol we have all been exposed to military drill and ceremonies. From our first day in this organization we have been learning and practicing these two important areas of our training. As a commander of a Ranger Team it is imperative that you and your Team become proficient in drill and ceremonies.

Drill: A well trained Ranger Team is not only proficient in Ranger work, but also in military drill. Much of what we do when we drill may seem as if it has no purpose but to tire us out; but, on the contrary, drilling the Team accomplishes very definite goals. Although the main reason for learning and teaching drill is to move a body of personnel from one point to another in an orderly fashion, military drill serves other functions.

1. It organizes the Team into a cohesive, well organized, and disciplined unit.

2. It trains your personnel to accept commands and orders without question, and execute them in a good, efficient manner.

3. It builds "esprit de corps" within the Team.

4. It presents a good picture to outsiders as well as to other CAP units.

5. It becomes a part of the Team's physical fitness program.

With these points in mind, let us drill the Team and ourselves until we attain a snap and precision of which we can all be proud.

Ceremonies: When we speak of ceremonies we are not only referring to such things as parades, reviews, or military funerals but all aspects of military customs and courtesies. These include:

1. Saluting.

2. Reporting to an officer.

3. Proper wearing of the uniform and accessories.

4. The proper display and respect of the American Flag and flags of organizations, units, and other countries.

5. Respect to all officers.

6. An understanding of various types of military parade formations and their proper execution.

How well your unit practices military customs and courtesies will reflect not only on you as the leader and your Ranger Team, but also on all of Civil Air Patrol. You do not want your personnel to act like a bunch of untrained, disorganized individuals. Books and other materials concerning drill and ceremonies are included in the list of references at the end of this manual.

2.9.3 FIELD TEAM CONTROL

Your leadership abilities will surface and prove themselves when you command a Team out in the field. There are primarily two types of field operations that you will be confronted with as a leader.

Training Missions: The training mission could be local or Wing organized through a SARCAP or Wing school. Under these conditions

your primary concern as a leader will be twofold: First, to train your Team in all phases of Ranger work; and second, to have your Team practice what you have already taught them. Much of your training mission will be pre-planned well in advance of actually going out into the field. Most of the command decisions will have been made, and possible problems well thought out. Of course, an emergency in the field will change the entire picture.

REDCAP: This type of mission differs distinctly from that of the one just discussed. Now there is no time to review particular phases of Ranger work, no time to spend long hours thinking things through, little time for detail work, and no time for confusion or wondering what to do next. This is the time for complete organization, cooperation, confidence in yourself and your Team, and the ability to make the correct decision on short notice. Your real potential and abilities as a leader come to the forefront when a decision is needed on a moment's notice and the outcome of that decision or command could mean life or death for someone.

Much of the lost time, confusion, and inability of a commander to make a quick, accurate decision during a REDCAP can be eliminated through the proper use of the training missions. If you as a commander have a complete understanding of all the information in this manual and related materials, have trained your Team well, have gone out on training missions with your Team, and have simulated possible search and rescue situations for you and your Team to solve and execute, you will be better able to handle yourself during an actual emergency.

Here are some hints that will enhance your control over your Team in the field.

- Make sure everyone knows the objective of the mission.
- Make sure everyone knows the plan of attack to be followed.
- Make sure your personnel have confidence in you as a leader.
- Make sure all personnel know the chain of command.
- Make sure every person knows exactly his position and duties on the Team, and his Team's relation to the rest of the Teams' activities and the mission as a whole.
- Make sure you have good communications within your Team and to the outside.

- Make your commands clear, concise, and definite.
- Make sure you keep cool, calm, and collected no matter what happens. Never show any sign of nervousness, confusion, panic, or indecision to those around you.
- Make sure you know the capabilities and shortcomings of each and every member of your Team.
- Make sure your Team is well equipped and trained to handle any eventuality.

Remember: Practice makes perfect. Have your Team train in the field often and under all types of conditions. In that way you will have many chances to practice field Team control.

2.9.4 METHODS OF TEACHING*

Over the years there have been many books and articles written on the subject of methods of teaching. It will be our objective here to consider and discuss the major factors involved in this subject.

Methods: The instructor creates the teaching-learning situation. Part of this job includes the selection of teaching methods which are systematic plans for presenting lesson materials. He may use discussion, lecture, demonstration, performance, coach-pupil, or a combination of these as a way for reaching the lesson objectives. Each instructor will use the method in his own manner, for techniques of teaching may differ. Let us learn about some of the various methods.

1. Lecture Method--Generally a situation in which the instructor does the talking or telling is called a lecture. Student participation consists mainly of attentive listening and perhaps by the taking of notes.

   The instructor must do most of the talking in some learning situations. The size of the group, time limitations, type of subject matter, availability of training equipment, etc., may demand the use of the lecture instead of some other method. From the standpoint of learning, however, there is a trend toward more emphasis upon the student's being as active as possible in the learning process. A lecture does not provide as effective a learning situation as one in which students

*NOTE: Major portions of this section have been abstracted from the USAF manual "Methods and Techniques of Teaching" used in the ECI Course 7c (Reference 18).

actively participate, inasmuch as the impact on the student is minimal and he is likely to forget parts of the material presented.

From the standpoint of time, a lecture is probably the most economical teaching method. Through a carefully planned lecture, many facts and much information can be given. Important ideas can be emphasized, main points can be summarized, and the relationship between the practical and the theoretical can be presented by the lecture method.

Perhaps the greatest disadvantage in using the lecture method of teaching is that students do not have an opportunity to participate personally in the lesson. Naturally, this method is not well suited for developing motor skills, cooperative thinking, and communicative skills. It is also difficult for the instructor to determine if understanding is taking place. Moreover, the instructor cannot adjust the material to individual needs, such as proper rate of learning. In short, the lecture method is not as suitable for student-centered teaching as other methods should be.

A lecture must be carefully planned. It calls for extreme care in the choice of illustrations, in comparisons, and in the presentation of facts and the opinions of others. Keep the following suggestions in mind when you must plan for and use the lecture method of teaching.

- Know as much as possible about your students, or audience, before you plan the lecture.
- Know the purpose of the lecture and see that your students also know that purpose.
- Do not memorize the lecture.
- If you plan to present the opinions of experts, spend some time in research.
- Check your vocabulary.
- Emphasize relationships between parts of the lecture. Brief summaries may be used to tie the lecture into a meaningful whole.

2. Discussion Method--The discussion method is primarily a talking and listening activity. Each student is encouraged to take an active part in this type of lesson. In brief, the instructor asks questions, poses problems, explains them, and directs student participation.

In a discussion, students talk as much as possible. They call on their past experiences and knowledge to aid them in answering questions or solving problems. They ask questions of the instructor and other class members. They "pool" their thinking, under the guidance of the instructor, and thereby develop understanding of the lesson.

A well planned and directed discussion provides for active student participation; makes it possible for an instructor to determine if his students understand; and it develops the student's ability to communicate, it directs his thinking in an orderly manner, and it increases teamwork and cooperation.

Here are some suggestions you may use in planning and conducting an effective discussion.

PLANNING:

- Study the lesson objectives.
- Plan a good lesson introduction.
- Plan the new lesson presentation. A good introduction paves the way into the new lesson material.
- Plan for an evaluation.
- Plan for a summary.

CONDUCTING:

- You, the instructor, act as a guide or leader in the discussion.
- Use good questions which will cause your students to take the "talking role."
- Provide a warm, friendly, and sincere atmosphere.
- Be alert to the differences between students.
- As instructor you must set a pattern for a meaningful discussion.

- Depend on your students to answer questions.
- Explain and present clearly the unknown portions of the material.
- Provide for proper emphasis on important points.
- Take advantage of every opportunity to provide for the satisfaction of your students' needs for belonging, recognition, status, and self-esteem.
- A discussion may be used in any part of a lesson.
- The discussion method of teaching is only as good as the instructor who uses it.

3. Demonstration Method--This method requires effective use of telling, discussing, and showing. In other words, if the instructor chooses the demonstration method, he wishes to show his students how a skill, process, or procedure is accomplished. From the instructor's viewpoint, the demonstration provides an effective way to show the student what to do, how to do it, and why it is done a certain way.

Some of the advantages of the demonstration method are: 1) It saves time. 2) It appeals to more than one of the senses. 3) It gives the student contact with actual objects. 4) The combination of telling, discussing, and showing provides a situation in which the student learns through hearing, seeing, and many times through manipulation.

Here are some important factors in planning for and conducting a good demonstration.

- The instructor prepares himself and the classroom.
- He prepares the students for the demonstration through the use of a good introduction which tells the students what they are to learn, why they need the skill and information, and what they are expected to do when the class is completed.
- He presents the demonstration clearly and slowly so that all can understand.

- He has one of the students "run through" the demonstration as a means of review.

4. Performance Method--The instructor is using the performance method when he provides for his students to "do" something. Thus the performance method is learning by doing. The student actually accomplishes specified tasks under the control or supervision of the instructor. In this way the student develops understanding and skill.

   The main advantage of this method is that the student can learn by doing. In addition to providing the advantage of learning by doing, this method gives the instructor the advantage of being able to correct mistakes and misunderstandings as they are recognized. Thus, through this method, theory is put into practice.

   During performance learning, the instructor is busy using almost every method of teaching known. He tells, explains, demonstrates, asks questions, etc., while his students are performing. He can help his students individually and as a group. Instruction becomes more and more student centered, and the instructor uses whatever method is needed to guide each student in reaching the standard of performance expected.

   When students work together, as they often do in performance, they develop a group spirit and learn to cooperate. Simple as this may seem, it is another important factor in the development of "all-around" team members.

   Real skill and understanding of any activity are acquired by performance of that activity. It gives the student a closer contact with skills and principles to be learned. Because of this, he will learn faster and more effectively. Use of the performance method has been found to be one of the best ways in which to instruct Ranger classes.

5. Coach-pupil Method--In an ideal coach-pupil relationship, the instructor skillfully plans and presents a demonstration. He then works with one student at a time,

such as one pilot training another pilot. However, there may be times when a large class must be divided into groups. Even two instructors may be unable to supervise and coach the students properly. In the coach-pupil method, members of these groups may be alternated, acting as a coach one time and a pupil the next. Thus each student has a chance to practice, observe, and evaluate his own as well as other performances. All of these experiences aid the student in learning. Naturally, such a performance should be preceded by a skillfully planned and executed demonstration by the instructor.

Although each teaching method has advantages, the use of the performance method is stressed in Civil Air Patrol Ranger training. Through performance, the student learns to do by doing. That is, learning results from self-activity of the student.

The instructor's job is mainly one of planning and directing. As the instructor plans for learning activities, he keeps in mind the destination toward which he and his students are striving--he knows the objectives! When he knows the objectives, understands the background training of his students, takes an inventory of equipment and aids, and considers the time element, he probably will make few mistakes in his choice of the proper teaching method. In short, success in the use of any method of teaching will depend upon adequate preparation and effective presentation techniques.

Techniques: When we speak of the execution of the details of a teaching method, we are speaking of teaching techniques. Under each of the various methods discussed we have listed some of the techniques to be used for that particular method. Here we wish to list a few techniques which can be used in almost all teaching situations.

1. List the lesson objectives and then plan around them.

2. Prepare your lesson plan in a thoughtful manner keeping in mind all aspects of good instruction.

3. The classroom atmosphere should be conducive to learning. This means that the room should be well lighted, well ventilated, comfortable, free from all distractions, and well equipped for the lesson to be presented. Classroom atmosphere is difficult to control when teaching classes in the field, but the teacher can control it a little by using the natural environment to his advantage.

4. As an instructor you must be conscious of your posture, gestures, mannerisms, and facial expressions.

5. Oral communication between all persons in the classroom must be clear and concise. Your choice of words, the way you speak them, your tone of voice, and your actions while speaking will affect learning.

6. If using a blackboard be sure to erase whatever is on it before going on to something new. When you no longer need the information, get it off; otherwise students will be distracted by it. Of course, you will erase the board before leaving the room.

7. Your attitude toward the teaching situation will affect your presentation and the students' learning. Show your enthusiasm for what you are teaching.

8. Make sure you can be heard at all times, and that your speech is clear and understandable. Eliminate profanity, mannerisms, and speech errors which attract attention.

9. Maintain eye contact with your class as a whole, and with each individual in it. Make each student feel like you are talking directly to him and him alone.

10. Your classroom posture and actions should cause you and your students to feel that you have the entire situation under control.

11. You, and not your students, run the classroom.

12. Get to know your students' names, personalities, strengths, and weaknesses.

13. When using questions, ask the question first, pause to allow all the students to think about it, then name the person to answer it. Use a random selection when choosing the person to answer. Try to draw the answer out of a person by using easy questions that relate to and lead up to the answer wanted.

14. Do not use sarcasm as a means of class control.

15. Do not let over-eager (but well-meaning) students monopolize the conversation.

16. Do not overlook the quiet and reserved members of the class; try to "weave" them into the discussion, as well.

In the final analysis, success in teaching depends upon the effectiveness of techniques.

The instructor strives to see that instruction is student-centered, that objectives are made clear, that students participate actively, and that he chooses the best method and techniques for teaching each lesson. While teaching his specialty he tries to teach in such a way that his students gain permanent values from learning. Some of these values are correct thinking methods, the ability to cooperate in solving problems, skill in oral communication, and self-confidence.

No doubt the art of teaching depends more on practice and experience than on knowledge of principles, but one must know general procedures and principles upon which to build such skill. Each one of the methods may or may not be used during an entire lesson. Most instructors find that a lesson will need a combination of the various methods if the lesson objectives are to be reached. Becoming proficient in teaching takes a thorough understanding of the techniques and methods and how they are applied. The preceding treatment of teaching methods and techniques is admittedly brief, and it is suggested that anyone contemplating the instruction of Ranger classes continue his studies in the area of teaching before the attempt is made.

UNDERSTANDING IS OUR GOAL!

2.9.5 LESSON PLANS

When teaching a class, your starting point of planning will be your lesson plan. The purpose of a lesson plan is to identify your objectives in teaching the class and to organize the procedures you will use to get your message across to the students in a clear, effective manner. The basic format of a typical lesson plan follows, along with a detailed discussion of each area.

Name of the Instructor:_____ Date:_____

1. Subject: What exactly is being taught in the class. It could be a general or specific area.

2. Objectives: What is the reason for teaching the class and exactly what are the students supposed to get out of the class. Write down exactly what you want the students to learn. This will give direction to your planning

and procedures. Lesson objectives help the instructor determine the kind of learning situation he should provide for his students. It will also limit your discussion and keep you from going off the track. A class may have one or several objectives. Here are examples of a few.

- To teach the students how to tie a square knot.
- To teach the students how to construct a lean-to.
- To give the students an understanding of the importance of the proper selection of a camp-site.

3. Procedures: This is an outline of the format of your actual presentation of the lesson. The outline can be purely a topic outline or a detailed outline; this depends on your familiarity with the material. Your procedures should include good teaching methods and techniques.

4. Questions: This is a list of questions that you anticipate the class may ask and your answer to them.

5. Teaching Aids: This is a detailed list of all materials you are going to use during your presentation of the lesson.

6. Evaluation: This is your opinion of the effectiveness of the lesson, the procedures, and the materials used. Write down the good and bad points of your presentation.

The lesson plans should be kept for future classes of the same type. They should be studied and revised periodically to bring them up-to-date and make them more effective.

REFERENCES

1. Survival (AFM 64-5), USAF. Govt. Printing Office, Washington, D.C. $1.00

2. Boy Scout Handbook. To order see Ref. 21

3. Skills for Taming the Wilds, by Bradford Angier. The Stackpole Company, Cameron and Kelker Streets, Harrisburg, Penna. 17105.

   A good book for those interested in digging further into the subject of woodsmanship. Very thorough, and contains many practical suggestions from one of the best wilderness authors.

4. Search and Rescue (CAPM 50-15, Parts I & II), Civil Air Patrol, Maxwell AFB, Alabama. Price: None.

5. Lightweight Equipment, by the Potomac Appalachian Trail Club, 1916 Sunderland Place, N.W., Washington 6, D.C. $0.75

   A survey, with recommendations based on experience, of available equipment for hiking, camping, and mountaineering. Contains addresses of suppliers, comments on design and usefulness, and weights of many items. Revised every few years to keep current.

6. FM 31-72 Mountain Operations, U.S. Army Field Manual.

   Many sections apply to CAP Ranger Teams. Section on steep terrain evacuation of casualties, and section on basic rock climbing are particularly good.

7. Mountain Rescue Techniques, by Wastl Mariner (1963). Distributed by The Mountaineers, P.O. Box 122, Seattle, Washington, 98111.

   A very complete handbook showing many of the specialized techniques needed in mountain search and rescue. The official manual of the International Commission for Alpine Rescue. $3.15

8. Frostbite, by Bradford Washburn, Museum of Science, Boston, Mass.

   A thorough discussion of frostbite, what it is, how to prevent it and how to treat it. Should be read by every field commander before taking a team into the field during cold weather. $1.00

9. Survival - Training Edition (AFM 64-3), USAF. Govt. Printing Office, Washington, D.C. Price: Unknown.

10. Knots for Mountaineering, by Phil D. Smith, Address: The Desert Trail, Twenty-nine Palms, Calif. Price unknown.

11. Topographic Maps, U. S. Geological Survey, Washington Distribution Section, 1200 South Eads St., Arlington, Va. 22202. Price: None

12. Rescue Skills and Techniques (FG-E-11.1), Office of Civil Defense. U. S. Govt. Printing Office, Washington, D. C. Price: None

13. Mountain Search and Rescue Operations, Division of Ranger Activities of Grand Teton Nat'l. Park. Grand Teton Natural History Assn., Grand Teton Nat'l. Park, Moose, Wyoming. $1.00

14. Fundamentals of Rock Climbing, M. I. T. Outing Club, Student Center, Room 490, Mass. Institute of Technology, Cambridge, Mass. Price: Unknown.

15. Belaying the Leader, An Omnibus on Climbing Safety, by members of the Sierra Club. Available from The Sierra Club, Mills Tower, San Francisco, or 25 West 45th St., New York, N. Y. $1.95

    An excellent basic discussion of the proper safety techniques to use in rock climbing with complete explanation of underlying theories.

16. Survive in the Outdoors, Wayne Winters, Tombstone Nugget Publishing Co., Box 462, Tucson, Ariz. $2.00

17. Drill and Ceremonies (AFM 50-14), USAF. Hdqtrs. Air Training Command, Randolph AFB, Texas. Price: Unknown.

18. Extension Course Institute (Course 7c), USAF. Price: None.

    Booklets Included: Leadership, Psychology for Leadership, Human Relations, Air Force Instructor, Methods and Techniques of Teaching.

    Any senior member may obtain this booklet by enrolling in EIC Course 7c through his local CAP Squadron.

19. Lightning Hazards to Mountaineers, by Alvin E. Peterson. Reprinted from the American Alpine Journal (1962). Published by the American Alpine Club, 113 East 90th Street, New York 28, N. Y. The author is an engineer in the High Voltage Section of the National Bureau of Standards and provides material to separate fact from folklore regarding lightning. Price unknown (less than one dollar).

20. First Aid, American Red Cross. Available from any local Red Cross office. $0.75

21. Boy Scout Merit Badge Series. Merit badge series pamphlets, as well as BSH, are available through the local Boy Scout Headquarters, or from: Boy Scouts of America, New Brunswick, New Jersey. Price: BSH--$1.00; Merit Badge Series: about $.35 per pamphlet.

    Fine topical discussions (in pamphlet form) of a wide range of useful subjects, including camping, pioneering, cooking, hiking, swimming, lifesaving, public speaking, safety, radio, signaling, aviation, and many, many more. Very good supplementary source for lesson-planning. BSH lists and describes the many volumes in the Merit Badge Series.

APPENDICES

APPENDIX I
RANGER INSIGNIA AND UNIFORMS

Base Uniform (Illustrated)

This uniform is worn whenever the Ranger Team is on base duty at a CAP base of operations or in contact with the public. Uniform consists of the following items:

1. Fatigues - Green army type fatigues. Clean and pressed.
2. Cap - Orange baseball cap with unit numerals in 2-inch black numbers.
3. Scarf - A neck scarf is used to designate key personnel:
   Orange - Wing Ranger personnel and Group Ranger Coordinators.
   White - Ranger Team Commanders, both cadet and senior.
   Blue - Infantry blue scarves may be worn by all members of a team at the commander's option. Team Commanders still wear white.
4. Collar Insignia - CAP insignia and/or rank as prescribed by CAP uniform regulations.
5. Wing Shoulder Patch - As prescribed by CAP uniform regulations. Pennsylvania Rangers who have achieved R/1 status substitute Ranger Shoulder Patch.
6. School Insignia - Rangers who have completed both a summer and winter Ranger School at Hawk Mountain wear the Westover Wings. Worn above left breast pocket, centered, 1/2 inch above name tape.
7. Name Tape - Name tape with the Ranger's last name in black letters 5/8 inch high on olive drab tape is worn centered above left breast pocket. Bottom of tape should touch top of pocket, and tape should extend to edges of pocket.
8. CAP Breast Patch - Metal or cloth insignia is worn 1/2 inch over right breast pocket as per CAP uniform regulations.
9. Ranger Proficiency Patch - This patch is worn centered over the right breast pocket, between the pocket and the CAP Breast Patch. It should touch both the pocket and the CAP Breast Patch.
10. Pistol Belt - A webbed pistol belt is worn. Color: white, except for Expert Rangers (R/Ex) who wear black. Trim: brass.
11. Boots - Black army jump boots or, during hot weather, jungle boots. Clean white nylon laces will be worn with ladder lacing.

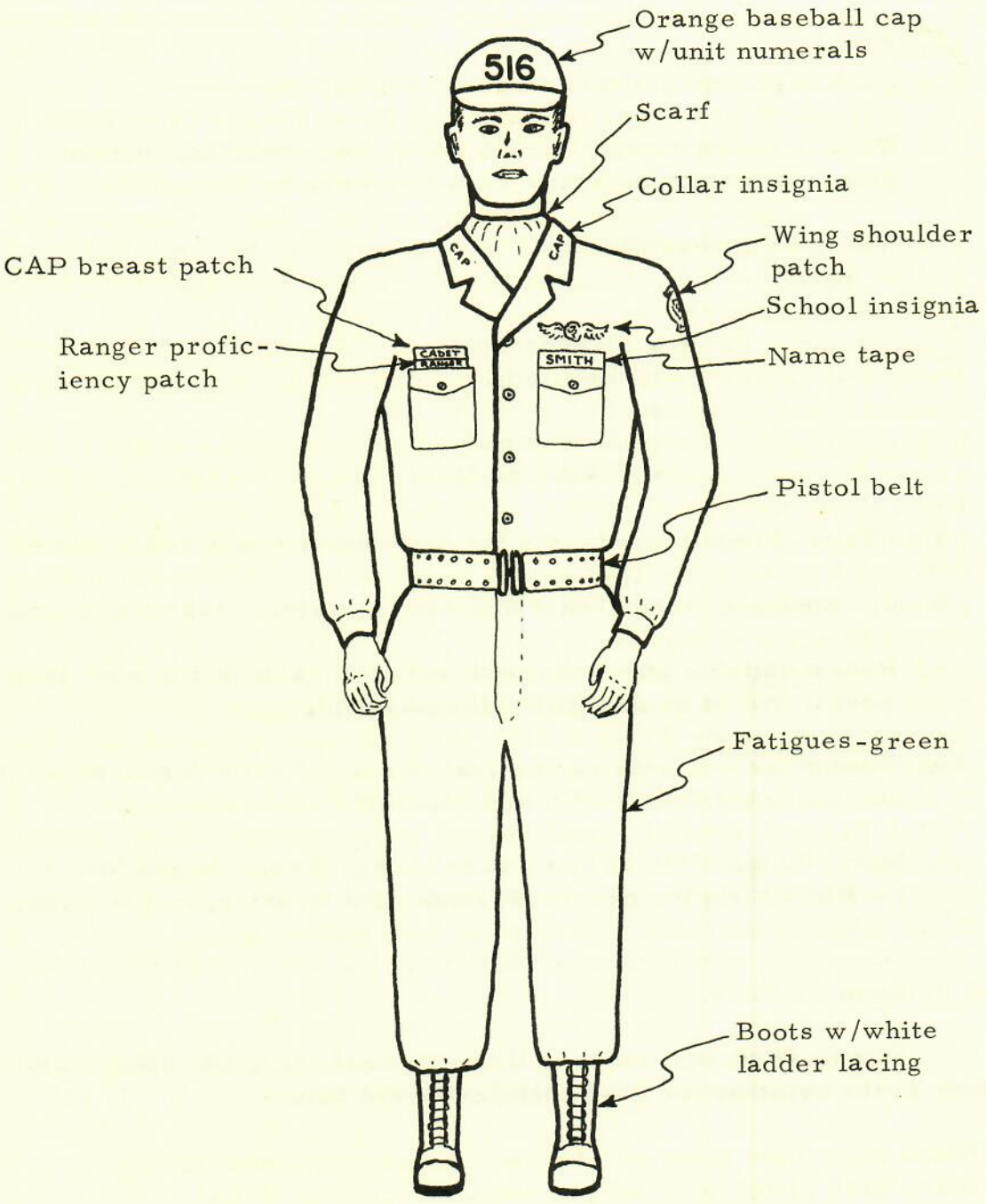
Field Uniform

This uniform will be worn while the team is in the field. The uniform is the same as the base uniform except that:

1. Black nylon boot laces will be worn with conventional lacing.
2. Olive Drab pistol belts will be worn. (Black for R/Ex)
3. Scarves need not be worn.
4. Fiberglass hard-hats may be worn when safety dictates. Color: Orange. Unit numerals as on cloth caps.

Winter Uniform

Suitable winter clothing adapted to cold weather conditions should be used to augment the above uniforms. The clothing should be of good quality as it will be put to hard use.



RANGER BASE UNIFORM

APPENDIX II

SPECIFIC ACHIEVEMENTS FOR RANGER SECOND CLASS (R/2) GRADE

_____ 1. Discuss care and use of three items of Ranger equipment selected by the test administrator.

_____ 2. Set up and properly ditch an overnight shelter such as a pup tent.

_____ 3. Explain the requirements for cold weather bedding.

_____ 4. Clearly state the dimensions for a straddle trench latrine and explain proper garbage disposal procedure.

_____ 5. Build a fire using only a knife, two matches, and locally gathered wood, observing all safety requirements.

_____ 6. Tie three of the following knots (to be chosen by the test administrator):

- Square Knot
- Bowline
- Two Half Hitches
- Sheet Bend
- Taut-line Hitch

_____ 7. Explain proper care of feet for both summer and winter hiking.

_____ 8. Demonstrate proper care and use of knife, machete and axe.

_____ 9. Pass a uniform and equipment inspection and participate in at least a five mile hike with full equipment.

_____10. Discuss the elements of survival mentioned in the Woodsmanship section of the Ranger Training Manual.

_____11. Give a detailed explanation of the prevention, recognition, and care of frostbite, heat exhaustion, heat stroke and snake bite.

_____12. Identify five Hand and/or Whistle Signals chosen by the test administrator.

The above achievements will be dated and initialed by the Senior Ranger Team Commander when they have been completed to his satisfaction.

APPENDIX III
PHYSICAL FITNESS TESTS

A. RANGER (R/1) QUALIFICATION TEST

15 push-ups
3 pull-ups
20 squat thrusts in one minute
1/2 mile run in 4 minutes or less.

B. EXPERT RANGER (R/Ex) QUALIFICATION TEST

20 push-ups
5 pull-ups
25 squat thrusts in one minute
1 mile run in 8 minutes or less
10 foot vertical rope climb
100 feet carry of a person his own weight
100 yard swim non-stop
- Surface dive and retrieve a weight from under water.

The above tests will be administered by Wing Ranger Section personnel only. Failure on any one item is failure of the complete test. Failed parts may, however, be redone at a later time without taking the complete test again.

APPENDIX IV

RANGER FORMS

Samples of the Ranger Forms used in the Pennsylvania Wing are attached in this Appendix. These forms may be detached and used.

The following forms are attached:

1. RNGF-1 -- Monthly Ranger Team Report (PAWG Form 50-1)

2. RNGF-2 -- Declaration of Intent to Join a CAP Ranger Team.

3. RNGF-3 -- Record of R/1 Test.

4. RNGF-4 -- Letter Requesting Administration of R/1 Test.

MONTHLY RANGER REPORT - Mail to PAWG HQ by 10th of fol. month.

UNIT	ADDRESS	For MONTH of

SENIOR RANGER TEAM COMMANDER	CADET RANGER TEAM COMMANDER

(List name, rank, address, phone, include ZIP and area code.)

List number of ACTIVE RANGERS

	Senior	Cadet
R/Ex		
R/Ad		
R/1		
R/2		
R/3		
Total		

List RADIO EQUIPMENT

Number	Power	Frequency	Unit-Owned?

RANGER VEHICLE

Type	Condition	Mileage

List SPECIAL PURPOSE EQUIPMENT

List RANGER ACTIVITIES during month of report - date and description
(attach travel orders or roster and copy of mission log)

PAWG Form 50-1
Reproduce Locally
(Penna RNGF-1 Dec. 69)

SIGNATURE

Senior Ranger Team Commander

DECLARATION OF INTENT TO JOIN A CAP RANGER TEAM

Name - last, first, initial	CAPSN	Date

Statement by Cadet

I hereby request permission to join the Squadron _____ Ranger Team. I promise to apply myself faithfully to learning Ranger Skills and promoting the activities of the Team. I will prepare myself for emergency rescue service and keep myself ready to serve at all times.

Date	Signature of Cadet

Statement by Parent or Guardian

I approve of my son joining his Squadron Ranger Team. I understand that the activities are strenuous and that some element of danger may be present. My son is in good physical condition and I believe that he will benefit from the program. I waive any claims against Civil Air Patrol that may arise from my son's participation in the Ranger Program. The Squadron (does) (does not) have my permission to take my son out of school for emergency missions.

Date	Signature of Parent

Statement by Squadron Commander

I certify that the above applicant has passed Phase I of the Aerospace Education Program and is in Physical Category 1. He has my approval to join the Ranger Team of this Squadron.

Date	Signature of Sqdn. CO.

Every cadet member of a CAP Ranger Team must have a fully completed copy of this form in his personnel folder at Squadron.

Penna. Wing RNGF-2 (March 69)
Local Reproduction Authorized.

CHECK SHEET FOR R/1 CLASS TEST

NAME _____ Home Sqdn _____ CAPSN _____
Last First MI

The above named CAP member has completed all requirements for R/1 class and, is in my opinion, prepared to take the R/1 class test.

_____
Signature of Senior Ranger Team CO or Sqdn CO

Send this form with letter requesting test.

Remainder of this form to be completed by testing officer.
(Testing officer: Place a plus mark, if passed, zero, if failed; in space provided to the right)

	+ or 0
1. Red Cross Standard First Aid Card or verifiable equivalent medical training.	1._____
2. Travel orders indicating participation in one wing SARCAP or REDCAP as a member of a Ranger Team.	2._____
3. CAP Radio Operator Proficiency Card #_____	3._____
4. FCC Rest. Radiotel. Operators Permit (FCC Form 753) #_____	4._____

PRACTICAL TEST

1. Correct Ranger Base Uniform (see current Ranger SOP)	1._____
2. Equipment-(had all required individual field equipment-- see current Ranger SOP)	2._____
3. Build a fire with two matches, knife, and local wood.	3._____
4. Tie three of the following knots -- (to be chosen by the testing officer):	4._____

1. Square knot 3. Two half hitches
2. Bowline 4. Sheet Bend 5. Taut-line hitch.

5. Show complete familiarity with lensatic compass.	5._____
6. Identify eight out of ten topographic map symbols.	6._____
7. Plot a two legged course on a topographic map; computing the heading and marks for each leg.	7._____

Penna. Wing RNGF-3 (Local reproduction not permitted; order from
Feb. 69 Wing Ranger Section.)

R/1 CLASS PHYSICAL FITNESS TEST:

	+ or 0
1. 15 push-ups	1. _____
2. 3 pull-ups	2. _____
3. 20 squat thrusts in one minute	3. _____
4. 1/2 mile run in four (4) minutes or less	4. _____

COMMENTS BY TESTING OFFICER:

Testing Officer: Return this completed form to Wing Ranger Section with answer sheet for written test.

_____ _____

Date Signature of testing officer

FOR WING USE ONLY:

Written test: Score _____

Card Issued: _____ _____

DATE NUMBER

FROM:

TO:

SUBJECT: Request for Administration of R/1 Test

1. The CAP personnel listed below are, in my opinion, qualified for the grade of Ranger, First Class. Therefore I am requesting that the R/1 test be administered to them. Notify me as soon as possible as to the date, time, and place of the test.

2. A completed RNGF-3 is inclosed for each of the personnel.

NAME	RANK	CAPSN

OFFICIAL:

Penna. Wing RNGF-4 - March 69 (See other side for instructions)
(This form may be reproduced locally.)

Instructions for filling out RNGF-4

1. Type Squadron letterhead at top of form.

2. Fill in FROM line.

3. Address letter TO your area Ranger Tactical Officer. (See current addresses below.)

4. List names, ranks, and CAP serial numbers for all individuals.

5. Sign letter under OFFICIAL line.

Addresses of Pennsylvania Area Ranger Tactical Officers (March 69).

Eastern Area

Major Thomas E. Jensen
2230 Kemmerer Street
Bethlehem, Penna. 18017

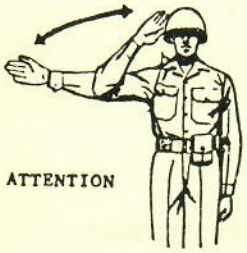
Central Area

Lt. Glen D. Kreider
Box 575
State College, Penna. 16801

Western Area

Capt. Frank Fork
Box 11123
Pittsburgh, Penna. 15237

APPENDIX V
HAND SIGNALS

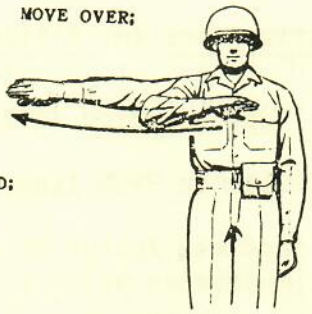


ATTENTION

HALT; OR STOP

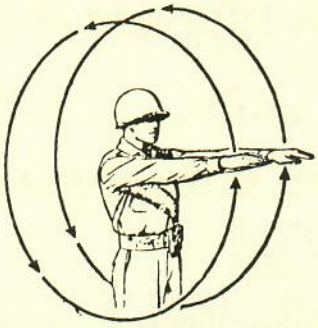
MOVE AHEAD;
JOIN ME;
FOLLOW ME

MOVE OVER;

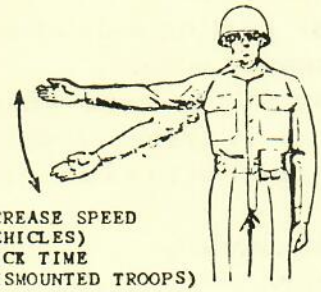


INCREASE
SPEED; OR
DOUBLE TIME;
OR RUSH

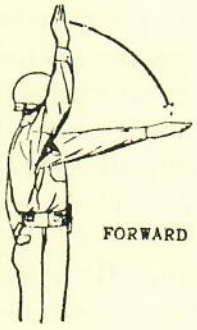
ARE YOU READY?
I AM READY
READY?



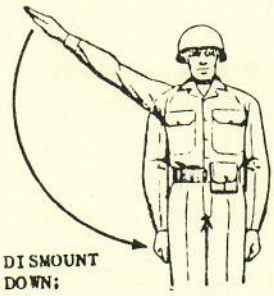
MARCH COLUMN



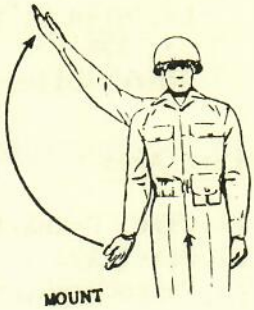
DECREASE SPEED
(VEHICLES)
QUICK TIME
(DISMOUNTED TROOPS)



FORWARD

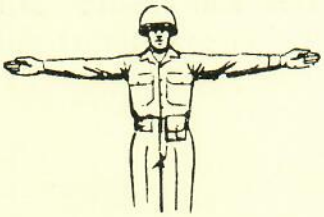


DISMOUNT
DOWN;

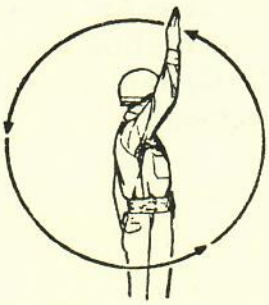


MOUNT

AS YOU WERE



LINE FORMATION



COLUMN

ASSEMBLE or RALLY

APPENDIX VI
PHONETIC ALPHABET AND RADIO PROWORDS

The following material is abstracted from CAPM 100-2 for the convenience of Rangers who do not have their own copy of that manual. The list of prowords is abridged, and contains only the more commonly used words in field communications. See CAPM 100-2 for the full list.

Phonetic Alphabet

A	ALFA	J	JULIET	S	SIERRA
B	BRAVO	K	KILO	T	TANGO
C	CHARLIE	L	LIMA	U	UNIFORM
D	DELTA	M	MIKE	V	VICTOR
E	ECHO	N	NOVEMBER	W	WHISKEY
F	FOXTROT	O	OSCAR	X	X-RAY
G	GOLF	P	PAPA	Y	YANKEE
H	HOTEL	Q	QUEBEC	Z	ZULU
I	INDIA	R	ROMEO		

Prowords

1. AFFIRMATIVE - Permission granted, or "yes."
2. CORRECT - You are correct, or that is correct.
3. EMERGENCY - This message is of emergency precedence.
4. FIGURE(S) - Numeral(s) or number(s) follow.
5. GO AHEAD - proceed with your message.
6. INCORRECT - You are incorrect, or that is incorrect.
7. I SAY AGAIN - I am repeating transmission or portion indicated.
8. I SPELL - I shall spell the next word using phonetic letters.
9. MAYDAY - An international distress call. May only be used when a plane, ship, vehicle, or person is in grave danger.
10. NEGATIVE - Not received, "No," not correct, permission not granted.
11. OUT - This ends my transmission. No reply is needed.
12. OVER - This ends my transmission, please reply.
13. READ BACK - Repeat the entire transmission to me for verification.
14. ROGER - I have received your last transmission. Will comply with any requests in it.
15. SAY AGAIN - Repeat your last transmission. (Never use the word "Repeat" as a proword. It has a specific meaning in directing artillery fire and should not be used here.)
16. VERIFY - Verify this message with the originator and send correct version.

APPENDIX VII
INDIVIDUAL EQUIPMENT LISTS

A. Summer

On Person

1. Proper Clothing
2. Gloves
3. Pistol Belt (webbed)
4. Knife
5. First Aid Kit
6. Canteen with Cup
7. Compass
8. Matches (waterproofed)
9. Kleenex or Toilet Paper
10. Can Opener
11. Ranger Rope, Nylon (12 ft., 5/16")
12. Signal Mirror
13. Pencil and Paper

In Pack

1. Pack Sack or Pack Frame
2. Sleeping Bag or Bedroll
3. Ground Cloth
4. Poncho
5. Jacket or Sweater
6. Spare Socks and Underwear
7. Fire Starters or Sterno
8. Mess Kit and Utensils
9. Brillo Pad or Equivalent
10. Food (three days)
11. Soap, Towel, Washcloth, and Toothbrush
12. Flashlight and Batteries
13. Rope, 25 ft., thin, strong
14. Hatchet, Machete, Shovel or Axe
15. Insect Repellent (optional)

B. Winter

Where winter weather indicates the need for special equipment, the Summer equipment list may be modified to include some or all of the following items:

Winter Clothing

Long Underwear
Parka
Mittens
Winter Headgear
Insulated Boots

Snow and Ice Equipment

Snow Goggles
Ice Creepers
Snow Shoes
Crampons
Alpenstock or Ice Axe

Shelter

Mountain Tent

Miscellaneous

Chap-stick
Foam pad or extra blankets (for insulation under sleeping bag)

Comments on the above items are included in the text of this manual in the sections on Woodsmanship, Survival, and Mobility. For further information, consult these sections. See Appendix I for details on the uniform.

DIFFERENCE BETWEEN MAP AND OVERLAND DISTANCES IN FEET BASED ON CHANGE IN ELEVATION

CHANGE IN ELEVATION

MAP DISTANCE	20	40	60	80	100	120	140	160	180	200	220	240	260	280	300	320	340	360	380	400	420	440	460	480	500
100.	1	7	16	28	41	56	72	88	105	123	141	160	178	197	216	235	254	273	292	312	331	351	370	390	409
200.	0	3	8	15	23	33	44	56	69	82	97	112	128	144	160	177	194	211	229	247	265	283	301	319	338
300.	0	2	5	10	16	23	31	39	49	60	72	84	96	110	124	138	153	168	184	199	216	232	249	266	283
400.	0	1	4	7	12	17	23	30	38	47	56	66	77	88	99	112	124	138	151	165	180	194	209	224	240
500.	0	1	3	6	9	14	19	24	31	38	46	54	63	73	83	93	104	116	128	140	152	166	179	193	207
600.	0	1	2	5	8	11	16	20	26	32	39	46	53	62	70	79	89	99	110	121	132	144	156	168	181
700.	0	1	2	4	7	10	13	18	22	28	33	39	46	53	61	69	78	87	96	106	116	126	137	148	160
800.	0	0	2	3	6	8	12	15	20	24	29	35	41	47	54	61	69	77	85	94	103	113	122	132	143
900.	0	0	1	3	5	7	10	14	17	21	26	31	36	42	48	55	62	69	76	84	93	101	110	119	129
1000.	0	0	1	3	4	7	9	12	16	19	23	28	33	38	44	49	56	62	69	77	84	92	100	109	118
1100.	0	0	1	2	4	6	8	11	14	18	21	25	30	35	40	45	51	57	63	70	77	84	92	100	108
1200.	0	0	1	2	4	5	8	10	13	16	19	23	27	32	36	41	47	52	58	64	71	78	85	92	99
1300.	0	0	1	2	3	5	7	9	12	15	18	21	25	29	34	38	43	48	54	60	66	72	78	85	92
1400.	0	0	1	2	3	5	6	9	11	14	17	20	23	27	31	36	40	45	50	56	61	67	73	79	86
1500.	0	0	1	2	3	4	6	8	10	13	16	19	22	25	29	33	38	42	47	52	57	63	68	74	81
1600.	0	0	1	1	3	4	6	7	10	12	15	17	20	24	27	31	35	39	44	49	54	59	64	70	76
1700.	0	0	1	1	2	4	5	7	9	11	14	16	19	22	26	29	33	37	41	46	51	56	61	66	72
1800.	0	0	0	1	2	3	5	7	8	11	13	15	18	21	24	28	31	35	39	43	48	52	57	62	68
1900.	0	0	0	1	2	3	5	6	8	10	12	15	17	20	23	26	30	33	37	41	45	50	54	59	64
2000.	0	0	0	1	2	3	4	6	8	9	12	14	16	19	22	25	28	32	35	39	43	47	52	56	61
2100.	0	0	0	1	2	3	4	6	7	9	11	13	16	18	21	24	27	30	34	37	41	45	49	54	58
2200.	0	0	0	1	2	3	4	5	7	9	10	13	15	17	20	23	26	29	32	36	39	43	47	51	56
2300.	0	0	0	1	2	3	4	5	7	8	10	12	14	16	19	22	24	28	31	34	38	41	45	49	53
2400.	0	0	0	1	2	2	4	5	6	8	10	11	14	16	18	21	23	26	29	33	36	39	43	47	51
2500.	0	0	0	1	1	2	3	5	6	7	9	11	13	15	17	20	23	25	28	31	35	38	41	45	49
2600.	0	0	0	1	1	2	3	4	6	7	9	11	12	15	17	19	22	24	27	30	33	36	40	43	47
2700.	0	0	0	1	1	2	3	4	5	7	8	10	12	14	16	18	21	23	26	29	32	35	38	42	45
2800.	0	0	0	1	1	2	3	4	5	7	8	10	12	13	16	18	20	23	25	28	31	34	37	40	44
2900.	0	0	0	1	1	2	3	4	5	6	8	9	11	13	15	17	19	22	24	27	30	33	36	39	42
3000.	0	0	0	1	1	2	3	4	5	6	8	9	11	13	14	17	19	21	23	26	29	32	35	38	41
3100.	0	0	0	1	1	2	3	4	5	6	7	9	10	12	14	16	18	20	23	25	28	31	33	36	40
3200.	0	0	0	0	1	2	3	3	5	6	7	8	10	12	14	15	18	20	22	24	27	30	32	35	38
3300.	0	0	0	0	1	2	2	3	4	6	7	8	10	11	13	15	17	19	21	24	26	29	31	34	37
3400.	0	0	0	0	1	2	2	3	4	5	7	8	9	11	13	15	16	19	21	23	25	28	30	33	36
3500.	0	0	0	0	1	2	2	3	4	5	6	8	9	11	12	14	16	18	20	22	25	27	30	32	35
3600.	0	0	0	0	1	1	2	3	4	5	6	7	9	10	12	14	16	17	20	22	24	26	29	31	34
3700.	0	0	0	0	1	1	2	3	4	5	6	7	9	10	12	13	15	17	19	21	23	26	28	31	33
3800.	0	0	0	0	1	1	2	3	4	5	6	7	8	10	11	13	15	17	18	20	23	25	27	30	32
3900.	0	0	0	0	1	1	2	3	4	5	6	7	8	10	11	13	14	16	18	20	22	24	27	29	31
4000.	0	0	0	0	1	1	2	3	4	4	6	7	8	9	11	12	14	16	18	19	21	24	26	28	31

APPENDIX IX

TEAM NAVIGATION EQUIPMENT

Field Navigation Kit

The following navigation aids are carried into the field by the Team Commander or the Team Navigator. They should be kept in a separate canvas carrying case for this purpose. Items marked * are optional.

Plotting Equipment:

Protractor or Aero Plotter
Straight-edge or Ruler
Pencils and Ball-point Pens
* Dividers
* Parallel Rule
* Circular Protractor

Maps:

Aeronautical Chart for State
Official Road Map for State (current)
Geodetic Maps of Immediate area
Map showing Search Area Numbers

Field Navigation Equipment:

Lensatic Compass
Navigation Line
* Night Navigation Line
Vests - 2 white, 2 orange - can be made from parachute material.
Navigation lights
Red Flashlight Filter
* Flashlight with Headstrap

Additional Navigation Equipment

The following items should be stored in a dry container with the Team's vehicle so that they will be accessible to the Ranger Team in operations away from their home base. One Team had a sheet-metal container constructed at a cost of about $8.00. The dimensions were 3 x 36 x 27 inches, large enough to store the 7 1/2 minute USGS maps without folding them. Of course, the box remained in the Team's vehicle at all times. The lid of the box provides a flat working area for plotting navigation problems.

Books:

AFM 64-5 (Survival)
Land Search and Rescue
First Aid
Ranger SOP

Maps:

Geodetic Maps for Group Area - 2 complete sets.
Index Map (USGS) showing positions of all geodetic maps for state. Search area numbers should be written in.

Miscellaneous:

* Masking tape, colored pins, plastic overlay, and other material for displaying plotted information on a situation map. Large sketching paper and colored pens can be used to prepare large-scale sketch maps for briefing Teams.